THE

AMERICAN REVIEW OF TUBERCULOSIS
ABSTRACTS OF TUBERCULOSIS

VOLUME XLI APRIL, 1940 ABST. No. 2

CONTENTS

	Pages
Tuberculosis of Lungs (*concluded*)	29–29
Tuberculosis of Other Organs than Lungs	29–41
Pathology	
a. *Morphological*	42–45
b. *Experimental*	46–52
c. *Body fluids*	52–53
Physiology	53–55
Bacteriology	55–56

Syphilis and Tuberculosis.—In a study of 13,239 adult patients with organic tuberculosis in Sea View Hospital during the years 1930 to 1937, the incidence of syphilis was 3.55 per cent. Therefore the total number of patients considered in this survey is 372. The incidence of activation of latent tuberculous lesions through the influence of arsenical injections for the treatment of syphilis is very small. Inasmuch as the average number of hospital days for the fatal syphilitic cases and for a nonselected group of nonsyphilitic cases was practically the same, it is felt that syphilis treated or untreated does not cause pulmonary tuberculosis to run a more rapidly fatal course. Since by use of newer methods in the treatment of pulmonary tuberculosis the life of the patient so afflicted can be greatly prolonged, it is felt that active therapy of coexistent syphilis should be carried out in order to prevent the development of aortic and central nervous system syphilis. Exudative lesions in the lung apparently resolve more often in patients treated with arsenicals for coexistent syphilis than in patients not so treated. Neither syphilis nor arsenical injections adversely affect the progress of therapeutic collapse, nor does syphilis treated or untreated interfere with the healing of thoracoplasty wounds. On many occasions it was found that the Kahn test gave fewer false positives than did the Wassermann with cholesterinized antigen, and that in general the Kahn test was a much more reliable diagnostic means than was the Wassermann in tuberculous patients. There is no evidence to prove that chronic or latent syphilis favors fibrotic changes, nor that the administration of arsenicals or heavy metals interferes with fibrosis. In this series of patients studied syphilitic lesions of the lung were not diagnosed by clinical signs or by autopsy.—*The Influence of Syphilis on Pulmonary Tuberculosis, S. Berg, Quart. Bull. Sea View Hosp., July, 1939, iv, 402.*—(*A. A. E.*)

Bronchial Tuberculosis.—Clinical recognition of tuberculosis of the trachea and major bronchi is a recent achievement and has advanced with the increasing use of bronchoscopy and bronchography. Tuberculosis of the major bronchi is always secondary to older disease in the lungs or intrathoracic lymph nodes. Erosion of the bronchi by adjacent caseous lymph nodes has long been known in children; in adults, bronchial compression rather than ulceration is more likely to occur. In most cases, bronchial tuberculosis is secondary to an open pulmonary lesion lying peripheral, most probably by direct implantation of the bacteria. Haematogenous infection also occurs, but is probably of little clinical significance. Pathologically, the usual tuberculous changes are seen. The end result of fibrous stricture with varying degree of stenosis, which is never complete, is of

great clinical significance. Twenty cases of major bronchial tuberculosis, confirmed by bronchoscopy, are reported; 3 of these were also examined postmortem. Bronchography was valuable in confirming the diagnosis in cases where there was marked stenosis. Tuberculous bronchial lesions may be latent for a considerable period. Study of this series brought out several points which are of diagnostic value. The persistence of a positive sputum in a patient with an apparently effective pneumothorax should lead to the suspicion of a bronchial lesion as the source of the bacilli. This is equally true in thoracoplasty cases. A low pitched sonorous wheeze or rhonchus is often present in association with bronchostenosis. This is most significant when it is constant, but an inconstant rhonchus may be important if it is always heard over the same point on the chest wall. The latter is usually the result of mucus lodging in a narrowed bronchus. As the bronchostenosis becomes more marked, there is progressive decrease in intensity of the rhonchus until it finally disappears. Bronchostenosis is often associated with collapse of the lobe or entire lung drained by the involved major bronchus. Therefore, bronchial disease should be suspected in pneumothorax cases whenever a portion of the lung exhibits extreme collapse without any tendency to reëxpand when pneumothorax is suspended. The lesion occurred most commonly in a main bronchus in this series. In only 9 was the obstruction so complete as to result in collapse of a whole lung. Attacks of dyspnoea, similar to asthma, sometimes are associated with marked narrowing of a major bronchus; usually there is extensive disease of the opposite lung. The mediastinal displacement following massive collapse of the lung is also a factor in the production of this respiratory difficulty. Air refills which restore the mediastinum to its normal position sometimes give marked relief. Bronchial compression and erosion by adjacent lymph nodes were also seen in this series. Haemoptysis, which is infrequent with ulcerations or granulations, is occasionally associated with this type of erosion. In 2 cases small traction diverticula, produced by adhesion of nodes to the oesophagus, were demonstrated. Patients with bronchial complications usually do poorly. The associated advanced pulmonary disease in itself warrants a poor prognosis. In these cases the beneficial results of collapse therapy are negated by the presence of a source of positive sputum which is not affected by the therapy. Moreover, even when the disease has healed, the resulting bronchostenosis may disable the patient by its effect on the respiratory function. Simple ulcers sometimes respond to cauterization. In the case of strictures, attempts at dilation are usually unsuccessful. It would seem that complete occlusion of the involved bronchus with resulting collapse and rest of the diseased pulmonary tissue would be of value in treatment. Up to the present it has not been possible in humans to produce complete closure of a bronchus by escharotic agents.—*Clinical Recognition of Tuberculosis of the Major Bronchi, A. G. Cohen & H. Wessler, Arch. Int. Med., June, 1939, lxiii, 1132.*—(*H. R. N.*)

Tuberculosis of Intercostal Lymph Nodes.—During the course of thoracoplasty for pulmonary tuberculosis, frequently an enlarged intercostal lymph node was encountered and removed for study. A total of 45 nodes were removed from 32 patients. The nodes averaged 1.2 by 0.8 by 0.6 cm. in size. In color they were red brown, pink gray, black or some combination of these. Most of them were found along the processes of the spine and angle of the rib, although they were also seen in the midaxillary line. The average duration of pulmonary disease in this group of patients was slightly more than three and one-half years. In 17 cases adhesions were considered extensive, and partial in 12, while in 3 their presence or extent was not known. Of the nodes removed, 28 showed histological evidence of tuberculosis in the sections examined, 10 were normal lymphoid tissue and 7 showed inflammatory changes not like tuberculosis. In 18 nodes carbon pigmentation was observed and this occurred in normal nodes as well as in those showing inflammatory changes. Eight nodes showing chronic inflammation on their removal gave no growth when cultured on ordinary media. Nonspecific chronic inflammatory changes and histological tubercles in these nodes might be assumed to be due to an involved pleura as seen where adhesions exist, or pleural involvement as in empyema. The carbon pigmentation must come from the lung parenchyma indicating the establishment of definite lymphatic communication to these nodes. This transmission of pigment represents a reversal of normal lymph flow. If this is true, the changes in the nodes do not necessarily indicate specific tuberculous disease of the pleura although it may exist. In one patient, in whom a node had been removed, a deep infection occurred, but this node showed normal structure without inflammatory changes. It is conceivable that trauma to the lymph channels could give rise to deep-seated infection.—*Tuberculosis of the Intercostal*

Lymph Glands: Lymphatic Drainage of the Pleura, W. Van Hazel, J. Thoracic Surg., December, 1938, viii, 219.—(L. F. B.)

Hilar Tuberculosis in Adults.—In a series of 97 autopsies in which there was neither gross nor microscopical evidence of active pulmonary tuberculosis, active tuberculosis of hilar lymph nodes was present in 19 per cent, and in approximately 33 per cent of the cases over the age of fifty. In the absence of reactivation in the primary infection in the lungs and from the existence of concomitant healed and recent foci in the nodes, the authors conclude that active tuberculosis of the hilar lymph nodes in adults is the result of reactivation of the hilar foci of the primary complex. While these hilar foci are a potential source of haematogenous dissemination, their tendency to heal suggests their benign nature.—*Die Häufigkeit und Bedeutung frischer aktiver Hilusdrüsentuberkulose beim Erwachsenen, M. Staemmler & U. Otto, München. med. Wchnschr., May 5, 1939, lxxxvi, 687.—(A. B. C.)*

Tuberculosis of Tonsils.—In large groups of the general population tonsillar tuberculosis has been reported in from 1 to 2.5 per cent. Tuberculosis of the tonsils has decreased with the general decline in the incidence of tuberculosis in the general population. These figures are based upon examination of removed tonsils. Tuberculosis of the tonsils is rarely superficial and seldom extensive; consequently, clinical diagnosis is difficult and only rarely made. Three types are recognized: focal cryptic tuberculosis, ulcerative and more massive disease, diffuse bilateral follicular disease. The latter type appears to be of haematogenous origin. In the majority of cases the lesion is focal, cryptic and unilateral. There is much disagreement over the question of primary or secondary localization in the tonsils. Involvement of the tonsils is common in patients with tuberculous cervical lymphadenitis. The authors examined microscopically 2,000 pairs of tonsils from routine tonsillectomies. One thousand pairs came from Indian reservations where the tuberculosis morbidity is high; 600 pairs came from Puerto Rico which has a somewhat lower morbidity and the remainder came from Philadelphia where the morbidity is low in comparison. Tuberculosis of the tonsils was found in 81 patients. The rate of tonsillar infection was as follows: Indians, 6.5 per cent; Puerto Ricans, 2.5 per cent; Philadelphians, 0.25 per cent. Many of the specimens showed considerable scarring with good evidence of healing. Only tonsils with tubercles that were histologically characteristic were included in the series. Chest roentgenograms were obtained in 35 of the 81 cases. In 18 of these there was evidence of active pulmonary tuberculosis of either the childhood or adult type; in most of these it is probable that the sputum was positive. In 12 instances the X-ray film was apparently normal; 2 of these had cervical lymph node tuberculosis and one had spinal tuberculosis. In 3 cases the chest roentgenogram gave evidence of a regressing childhood type of tuberculosis and in the remaining 2 the only abnormality was a calcified primary lesion. Although it was impossible to rule out an undiscovered tuberculous focus in the 9 apparently normal cases, the evidence would seem to point to exogenous, primary infection of the tonsils. On the basis of the histological lesions it seemed most probable that the tuberculosis of the tonsils found in association with open pulmonary tuberculosis arose from contact with bacillary sputum. In 75 per cent of the cases of tonsillar infection associated with open pulmonary tuberculosis the tonsillar involvement was bilateral, as contrasted with 42 per cent of the total number of cases. This would seem to be further evidence in favor of the sputum-contact theory. Only one tonsil was infected in 80 per cent of the cases in whom there was no evidence of tuberculosis elsewhere; this is considered in favor of the view that these may be examples of primary infection with small doses of bacilli. In haematogenous dissemination, after some time, bilateral involvement might be expected. Only one section of each tonsil was examined; serial sections might have revealed a greater incidence of bilateral lesions.—*Tuberculosis of the Tonsils, E. R. Long, M. V. Seibert & L. M. Gonzalez, Arch. Int. Med., April, 1939, lxiii, 609.—(H. R. N.)*

Tuberculosis of Spleen.—Tuberculous splenomegaly has been reported only one hundred times in the literature. A similar clinical picture occurs in apes. The present case is noteworthy in that it was preceded by the occurrence of a probable tuberculous cutaneous eruption before the splenic disease was manifest and a complication of subphrenic abscess resulting from the breaking down of the caseating spleen. Usually other tuberculous lesions are present elsewhere in the body, but none were present in this case. The mesenteric lymph nodes are frequently affected. The tracheobronchial lymph nodes may be involved. The disease occurs most commonly in the third and fourth decades. There is usually lassitude, pain in the region of the spleen, enlargement

of the spleen and anaemia. The filtering process of the spleen may explain the incidence of tuberculous lesions when none or only minimal lesions occur elsewhere. *Case Report*: Male, age 27, following influenza developed erythematous lesions on the points of the elbows and on the ankles, which early became bullous and later pustular. The lesions on the left shin developed into red granulation tissue. Cultures from deep and superficial lesions grew diphtheroids. Staphylococci and a few saprophytic organisms grew. The original lesion resembled an erythema multiforme. During the ensuing six months he ran a continuous pyrexic course with fever occasionally as high as 103°F. and a pulse of 130. The leg ulcers healed, but his general condition became worse. His haemoglobin diminished to 50 per cent; the sedimentation rate was 49 mm. in the first hour. He developed pain in the left lower chest, in the subcostal region and at the top of the shoulder. A subphrenic abscess was drained through a resection of part of the ninth rib in the posterior axillary line. The normal position of the spleen was filled with a necrotic mass. The patient's course continued down-hill even after adequate drainage of the abscess. One month later death from inflammatory lung infection followed. At autopsy the lungs were congested with purulent material. At the left base there was a thick pleural exudate so viscid that it prevented the spread of the infradiaphragmatic suppuration from the spleen into the lung although at one point the diaphragm had completely sloughed away. Only the lymph nodes proximal to the hilum were enlarged. The liver was deeply congested and contained multiple small discrete areas the histology of which suggested tuberculosis. The spleen weighed 67 g. The greater part of the organ consisted of a fibrous yellow honey-combed structure whose interstices were filled with yellow pus and necrotic debris. Toward the lower pole there were a few isolated areas of splenic tissue. Microscopically there were large areas of both advanced and recent caseating necrosis of tuberculous nature with only minimal cellular reaction. The kidneys had small abscesses similar to those found in the liver. Acid-fast organisms were demonstrated in preparations from the liver, spleen and abscess. Suspensions grew in guinea pigs with growth in succeeding implantations in guinea pigs but no growth in rabbits.—*Tuberculosis of Spleen with Tuberculous Subphrenic Abscess, W. G. Gill & W. N. Mann, Brit. J. Surg., April, 1939, xxvi, 661.*—(*F. J. P.*)

Chronic Pericarditis.—Nine cases of constrictive pericarditis one of which was proved tuberculous and 7 of which were operated are discussed. Intravenous tension of oxygen was increased, the venous pressure was elevated and circulation time was prolonged. The cardiac output per minute, the stroke volume and cardiac index were diminished. These values returned to normal or markedly improved following operation. The clinical manifestations of the syndrome have been well described by White. These cases demonstrate that chronic constrictive pericarditis should be considered in the presence of heart failure not associated with common aetiological causes. Patients with pericardial effusion in the absence of rheumatic heart disease should be kept under observation in order to detect the development of constrictive pericarditis. Although tuberculosis as a cause of the syndrome was suspected in all of these cases in only one of the 7 operated cases was it definitely proved. Medical treatment is mainly palliative. Mercupurin has been found effective in controlling the ascites. Digitalis is of no demonstrable value in controlling the tachycardia or in alleviating the decompensation. While the results of the surgical treatment in the authors' cases are undoubtedly striking, a study of the surgical cases as reported in the literature shows only 60 per cent of the decortication operations have resulted in cures or appreciable clinical improvement. Of the 143 cases collected from the literature by the authors (exclusive of their own), death occurred in 19 on the operating table and in 28 during the immediate postoperative period. All 7 of the authors' patients with chronic constrictive pericarditis subjected to pericardectomy have recovered. Three patients cured in that their symptoms have disappeared and they are able to lead normal active lives. Three patients are markedly improved and one is at present improved although sufficient time has not elapsed to make an accurate evaluation of the results of operation.—*Surgical Treatment of Chronic Constrictive Pericarditis, G. J. Heuer & H. J. Stewart, Surg., Gynec. & Obst., June, 1939, lxviii, 979.*—(*F. J. P.*)

Tuberculous Pericarditis.—This condition is reported in a ten year old Negro boy who died. Observations on some of the effects produced by increased intrapericardial pressure were made. Autopsy revealed severe extensive mediastinal tuberculosis, but the actual point of invasion of the pericardium could not be determined pathologically because of extensive changes in the

pericardial surfaces.—*Clinically Manifest Tuberculous Pericarditis, R. V. Platon, Am. J. Dis. Child., June, 1939, lvii, 1386.—(M. B.)*

Tuberculous Endocarditis.—The following is a report of the only instance of a tuberculous vegetation occurring on the surface of a heart valve in a series of 15,800 autopsies performed at the Johns Hopkins Hospital. A six year old colored boy was admitted to the hospital suffering from suspected tuberculous meningitis. Death occurred in six days. Autopsy revealed the presence of a generalized miliary tuberculosis with involvement of the brain and meninges. An interesting finding was the presence of a solitary polypoid vegetation composed of typically tuberculous tissue situated on the pulmonary valve. The core of the vegetation was for the most part caseous. It extended to the apex of the vegetation where it penetrated the epithelial covering which was otherwise intact. There was no adherent thrombus material. The underlying myocardium was apparently not involved. Microscopically the appearance of the vegetation was characteristic of tuberculosis and tubercle bacilli were found present in great numbers. The myocardium was normal.—*Tuberculous Endocarditis of the Pulmonary Valve, Case Report (with one plate), J. Mark, Bull. Johns Hopkins Hosp., December, 1938, lxiii, 415.—(J. S. W.)*

Tuberculosis of Stomach.—Tuberculosis of the stomach is comparatively rare, 368 cases having been reported in the literature. Incidence is 2 per cent in postmortem examinations on patients having died of tuberculosis. Incidence reported by investigators on gastric resection averages about 0.12 per cent. The disease may occur at any age, but is most common between the ages of thirty-five and forty-five years. Males are affected twice as frequently as are females. Infection usually occurs by way of the blood-stream but may occur by way of the lymphatics, direct infection of the mucosa and by direct continuity and contiguity of structure. There is no completely satisfactory explanation of the relatively high immunity of the stomach. The chief pathological types are: the ulcerating type, hypertrophic infiltrating type, acute miliary dissemination and extragastric forms involving the stomach. The ulcerating type is present in at least 80 per cent of cases. In approximately 10 per cent of cases gastric tuberculosis is associated with carcinoma. There is no proof of antagonism between the two conditions and the coexistence of both in the stomach seems too high to be coincidental. No reasonable explanation for this association has been suggested. Clinically, gastric tuberculosis simulates peptic ulcer, gastric carcinoma and gastric syphilis. Only rarely can the diagnosis be made before histological examination of the lesion. A positive diagnosis depends upon the demonstration of tubercle bacilli in the lesion. Treatment should always be surgical and resection of the involved portion of the stomach is the operation of choice whenever possible.—*Tuberculosis of the Stomach, O. T. Clagett & W. Walters, Arch. Surg., September, 1938, xxxvii, 505.—(L. F. B.)*

Intestinal Tuberculosis.—This is a review of the aetiology, symptoms and diagnosis of intestinal tuberculosis. The prognosis is bad. In an effort to prevent development of the disease, the patient should be instructed not to swallow sputum. It is important to give a mixture containing hydrochloric acid with the meals and to give full doses of all important vitamins. Careful attention must be paid to diet. Anything likely to cause intestinal movements should be avoided. Milk is often harmful. A low residue diet is advised. Various drugs, such as calcium chloride, may control the diarrhoea and relieve pain. Heliotherapy, either natural sunlight or ultraviolet radiation, offers encouraging results.—*Intestinal Tuberculosis, J. Maxwell, J. Roy. Inst. Pub. Health & Hyg., April, 1939, ii, 238.—(L. F. B.)*

Intestinal Tuberculosis.—The authors assume that when pulmonary tuberculosis is complicated by intestinal tuberculosis a relative avitaminosis and a demineralization are likely to exist. Therefore the need of a high vitamin and high mineral diet becomes apparent. The authors report the value of a high vitamin, high mineral, smooth diet, of calcium therapy and of heliotherapy. The study was limited to a series of 238 patients who had been under treatment for six months or more. These patients were divided into eight groups: Group 1-A was given the high vitamin, high mineral, smooth diet, plus ultraviolet radiation. Group 1-B was given the same diet without radiation. Group 2-A received calcium gluconate by mouth, plus the diet, plus ultraviolet radiation. Group 2-B received the same treatment as group 2-A without ultraviolet rays. Group 3-A received calcium chloride intravenously twice a week, plus the diet, plus ultraviolet rays. Group 3-B received the same treatment as group 3-A without

ultraviolet radiation. Group 4-A received calcium gluconate intramuscularly several times a week, plus the diet, plus ultraviolet rays. Group 4-B received the same treatment as group 4-A without radiation. It was found that patients receiving calcium by mouth, intravenously or intramuscularly, with or without ultraviolet radiation, showed a more definite improvement than did groups 1-A and 1-B, who did not receive calcium. Calcium taken by mouth was as effective as that received intravenously or intramuscularly. The patients receiving calcium gluconate or calcium chloride plus ultraviolet radiation seemed to show a higher percentage of improvement than those on a diet without calcium plus radiation. Patients who did not receive ultraviolet radiation, groups 1-B, 2-B and 3-B, showed a lower percentage of improvement than the corresponding groups receiving radiation. Ultraviolet irradiation apparently decreased the symptoms or at least kept them stationary in the larger percentage of cases, with or without calcium therapy. Patients who received pulmonary collapse showed a relatively greater percentage of intestinal improvement than those who did not receive it.—*Treatment of Gastrointestinal Tuberculosis, L. L. Hardt, M. Weissman, J. S. Coulter & K. J. Henrichsen, J. A. M. A., February 25, 1939, cxii, 691.*—(*G. L. L.*)

Perianal Tuberculosis.—Perianal infections occur in 5 to 10 per cent of patients with pulmonary tuberculosis. The lesion may be a discrete or subcutaneous and extending abscess, fistula, anal fissure or ulcer, lupus of the anus, or tuberculid. The results of operation in 50 tuberculous patients with perianal lesions are reported. Histopathological evidence of tuberculous granulation tissue was found in 75 per cent of these patients. The most common lesions were multiple abscesses and fistulae. Effective treatment demands radical excision of all infected tissue; the operation is to be performed in stages when the lesions are too extensive for complete extrication in one stage. Such radical surgery has resulted in the cure of 90 per cent of these patients.—*Peri-anal Tuberculosis, E. Granet & J. Gerendasy, Quart. Bull. Sea View Hosp., July, 1939, iv, 445.*—(*A. A. E.*)

Renal Tuberculosis.—In renal tuberculosis it is extremely difficult to prove clinically that one kidney is free of infection. From the standpoint of determining what tests should be employed, and what manifestations should be present in the so-called uninvolved kidney before the involved kidney is removed, the authors decided that the best approach to the problem would be the study of a series of postnephrectomy cases. A group of 1,131 patients was selected, in all of whom nephrectomy for renal tuberculosis had been performed at the Mayo Clinic over a period of twenty years, the shortest postnephrectomy period being five years. The youngest patient operated on was eight years of age and the oldest seventy-one. The disease affected almost twice as many males as females. That the disease is far more serious to the male is shown by the fact that in the study of ten-year survivals almost twice as many males as females were dead. The rather common occurrence of associated genital tuberculosis in the male may be a factor. The patients were divided into four main groups. Group 1, patients whose good kidney was not catheterized prior to operation. Group 2, patients whose good kidney was catheterized, and microscopical examination revealed either no pus cells or not more than three per high power field. Group 3, patients whose good kidney revealed from three to ten pus cells per high power field. Group 4, patients whose good kidney revealed more than ten pus cells per high power field. The groups were compared as to postoperative results both five and ten years following operation. The mortality rate was much greater in group 1 than it was in group 2. From the standpoint of patients cured, the difference was not so striking, but there was still a much larger percentage of cures in group 2. There was a much higher percentage of cures in group 1 than in group 4, which can be explained by the fact that all the good kidneys in group 4 contained considerable amounts of pus, whereas in group 1 a large percentage of kidneys were no doubt secreting microscopically negative urine. The results in group 2 were considerably better than the average for the entire series. In order to make a fairly accurate prognosis, catheterization of the good kidney is imperative. A negative urine leads to a favorable prognosis and the statistical data indicate that the patient may expect approximately 43.5 per cent chance of a five-year cure, a 65.2 per cent chance of being cured or improved, and only a 20.3 per cent chance of death within five years. If, in addition to this, inoculation of a guinea pig gives a negative result and no acid-fast bacilli are obtained, his chance of dying within five years will drop to 13.3 per cent, his chance of a five-year cure will be increased to 50.3 per cent, and his chance of being either cured or improved will increase to 75.2 per cent. If the guinea pig is positive, however, the patient's chance of dying within five years increases to 41.8 per cent and his chance of a five-year cure

drops to 21.8 per cent. If other factors do not contraindicate surgery, and if the excretory urogram of the good kidney is within normal limits, it seems to the authors that a positive guinea pig should not be considered a contraindication to surgical measures, although it would considerably alter the prognosis. When pus is found in the catheterized specimen of urine from the good kidney, the problem is radically altered. If more than three pus cells per high power field are found and the guinea pig or the smear is positive, the prognosis is poor and it is questionable if operation is warranted. If there is a small amount of pus, if guinea pigs and stains are negative and if the excretory urogram is normal, the prognosis seems to be reasonably good and possibly surgical measures are worth the trial, especially if there are not more than ten or fifteen pus cells per high power field.—*Renal Tuberculosis: Prognosis following Nephrectomy, Based on Preoperative Observations in the "Good" Kidney, J. L. Emmett & J. M. Kibler, J. A. M. A., December 24, 1938, cxi, 2351.*—(*G. L. L.*)

Renal Tuberculosis.—The following conditions indicate the advisability of a search for tubercle bacilli in the urine: (*1*) Unilateral renal infection. (*2*) Haematuria with no obvious explanation. (*3*) Pyuria with no organisms demonstrable by ordinary staining methods. (*4*) Persistent pyuria of any kind. (*5*) Cystitis which does not respond to a reasonable period of treatment. (*6*) Pyuria or dysuria in individuals with a history of tuberculosis or active extraurinary tuberculous lesions; nodular lesions in the seminal tract. (*7*) Urographic evidence of the destruction of renal tissue. It is generally recognized that cultural methods are slightly more accurate in the discovering of tubercle bacilli than are animal inoculations. In the matter of conservation of life the general resistance of the individual is the most important single factor in the whole picture. Climate is important. Renal tuberculosis apparently does not exist to any extent in Panama, for example, though there are many cases of pulmonary tuberculosis. Ultraviolet radiation and heliotherapy are very valuable in their effect on the general resistance when intelligently used. The influence of diet on resistance is also important. It should be rich in vitamins and supplemented with vitamins in concentrated form. Rest is highly important, and the patient should not engage in any strenuous activity after nephrectomy for periods ranging from several months to two years. The greater number of authorities deny that tuberculosis of the kidney ever heals. The author does not subscribe to this belief. The preponderance of data justifies early nephrectomy, and the earlier the recognition the better the results. In view of the fact that renal tuberculosis does heal, even in rare instances, the postoperative care is most vital. In the uncomplicated as well as the complicated cases a minimum of a year's constant supervision of the urine should be given. If economically possible the patient should spend at least a year in a favorable climatic environment.—*Renal Tuberculosis as a Community Problem, W. P. Herbst, J. A. M. A., July 29, 1939, cxiii, 371.*—(*G. L. L.*)

Renal Tuberculosis.—A destructive lesion can be identified only by retrograde pyelograms. Surgical treatment should not be undertaken until the patient has developed sufficient defense mechanism. Surgical or medical treatment should aim at the patient as a whole, for renal lesions are local manifestations of a constitutional disease. Nondestructive lesions are nonsurgical and tubercle bacilli found in one specimen from the renal pelvis is not an indication for nephrectomy. Unilateral, slightly destructive tuberculosis should be treated conservatively and nephrectomy is indicated only when progressive disease is present. Extensive unilateral destructive lesions are surgical. Operation is not indicated in bilateral destructive lesions except to relieve pain, haemorrhage or sepsis. Heliotherapy is beneficial but should be used only in selected cases. Proper treatment is predicated on a thorough understanding of tuberculosis, understanding that it is rarely possible to entirely extirpate tuberculosis, that 50 per cent of all cases can be arrested by medical means, that patients requiring surgery recover quicker if medical treatment precedes and follows operation and that no operative mortality is necessary. The kidney lesion is haematogenous, bilateral and usually cortical. It has a tendency to heal. If the organisms grow, they break into a tubule, infect the papilla producing a papillary ulcer. Before this occurs, the disease cannot be diagnosed. After the ulcer appears, there is descending infection. The ulcer produces tubular obstruction and a tuberculous cavity results involving the pyramid. With the onset of secondary infection, pyelonephritis develops and eventually pyonephrosis. Renal tuberculosis is said to be usually clinically unilateral and pathologically bilateral. The opposite kidney may be, and usually is, finally involved by an ascending infection. In two-thirds of the cases the problem is to determine the degree of involvement and not the presence

of disease. The most common manifestations in the excretory urogram are: no visualization, delayed visualization, caliectasis, evidence of necrosis in the outline of the calices, cicatricial deformity of the calices, deformity or dilatation of the ureter and pyelectasis. Pyuria, albuminuria, erythrocytes and casts are reported as twice as frequent in urine containing tubercle bacilli as that containing nonpathogenic acid-fast bacilli. Renal tuberculosis occurs more frequently in men than women, in the proportion of 3 to 1. Patients with renal tuberculosis rarely have normal urine, although the presence of tubercle bacilli depends upon the presence of a lesion in communication with the kidney pelvis.—*Review of Urologic Surgery, A. J. Scholl, F. Hinman, A. Von Lichtenberg, A. B. Hepler, R. Gutierrez, G. J. Thompson, J. T. Priestley, E. Wildbolz & V. J. O'Connor, Arch. Surg., February, 1939, xxxviii, 372.*—(*L. F. B.*)

Postnephrectomy Sinuses. — Sinus tracts that follow nephrectomy for a tuberculous kidney are notorious for persistence. In Sea View Hospital it has been customary to close the wound without drainage and by this method the number of postoperative sinuses has been reduced from 100 per cent to about 30 per cent. The present method in use is to completely excise the sinus tract as early as possible. The history of a twenty-four year old male is reported. This man had developed Pott's disease from the eleventh dorsal to the third lumbar vertebra in January, 1935. Soon after a psoas abscess was drained and a fusion performed for the diseased vertebrae. Early in 1936 he developed painless enlargement of both testicles and a draining sinus in the right scrotum. Examination revealed a tuberculous right kidney and right nephrectomy was done in August, 1936. The wound continued to drain and in March, 1937 a right perinephritic abscess was drained. In February, 1938 lipiodol was injected into the sinus and this demonstrated direct communication with the bronchial tree on the left. The sinus tract was then lavaged daily with ether according to the method of Gorelik and in December, 1938 he was discharged with the sinus completely closed and healed.—*Management of Post-Nephrectomy Tuberculous Sinus, Report of a Case of Secondary Broncho-Pleural Fistula, A. J. Greenberger & M. Parkes, Quart. Bull. Sea View Hosp., January, 1939, iv, 196.*—(*A. A. E.*)

Tuberculous Cystitis.—Failure of the urinary bladder to resume a normal condition after removal of all tuberculous foci in the urinary tract is not uncommon. Rest, for other parts of the body, is the best method of treatment, but for the bladder rest is impossible. The change in the vesical wall may be multiple ulcers, or the condition may progress to produce a contracted and sclerotic bladder wall with an extreme reduction in capacity. With tuberculous cystitis, as with other conditions, the upper portion of the urinary tract is endangered. The intramural portion of the ureter from the single kidney may be so involved as to result in hydronephrosis and eventual destruction of the kidney. Relief of the condition is urgently necessary. Treatment is frequently unsatisfactory. Nephrectomy, cystostomy, ureterostomy and ureteral transplantation to the rectum have been used as palliative measures. Satisfactory results in two cases are reported.—*End Results of Tuberculous Cystitis, J. B. Wear, Arch. Surg., November, 1938, xxxvii, 821.*—(*L. F. B.*)

Tuberculosis of Cervix Uteri.—The gross appearance of tuberculosis of the cervix uteri often closely resembles that of carcinoma. In few recorded cases in the past has the condition been correctly diagnosed before the cervical lesion was studied under the microscope. This is unfortunate because many patients could have been restored to a full and useful life had proper treatment been instituted. Among 33,580 reported instances of female genital tuberculosis there were 133 of tuberculosis of the cervix uteri. Of these 133 cases 13 were undoubtedly instances of primary tuberculosis. In approximately 42 per cent of these cases there was associated active pulmonary tuberculosis. The condition is, in approximately 85 per cent of cases, secondary to a tuberculous focus elsewhere in the body. Such primary foci may be found in the lungs or in either the gastrointestinal or the genitourinary tract. Of the 185 cases which the author has studied from the literature, in 156 there was demonstrable tuberculosis elsewhere. In 102 cases genitourinary tuberculosis was present in either an active or a quiescent stage. It is believed that the condition usually results from a descending infection spread by contiguity from foci situated higher in the pelvis or by haematogenous and lymphogenous routes from distant foci. Primary tuberculosis of the uterine cervix is rare. In this series of 185 cases studied there were 16 proved instances of primary infection. The condition is classified into four types: the ulcerative, the papillary, the miliary and the rare bacillary catarrhal. The typical lesion is ulcerated. The edges are either well

defined or undermined and are surrounded by either tubercles or normal appearing tissue. The adjacent portions of the vagina may be involved, and tubercles may be seen. Such a lesion may later degenerate into a huge ulcer with ragged undermined edges. Secondary infections are commonly superimposed on these lesions. Microscopically, typical tubercle formation is not commonly seen. Often atypical tubercles composed of only epithelioid and lymphocytic cells may be the only evidence on which a presumptive diagnosis of tuberculosis can be made. Acid-fast stains may be apparently negative. Inoculation of guinea pigs may prove to be the only reliable method by which a correct diagnosis can be established. The treatment should be of a radical surgical character, such as abdominal panhysterectomy with the possible preservation of one ovary. Local treatment of the cervical lesion is not advisable. Roentgen and radium therapy will often prove to be disappointing in their end results.—*The Management of Tuberculosis of the Cervix Uteri: A Report Based on 191 Cases, Six Cases Being Reported for the First Time, D. C. Collins, J. A. M. A., February 18, 1939, cxii, 605.*—(*G. L. L.*)

Genital Tuberculosis.—The authors present a statistical analysis of the incidence of genital tuberculosis observed over an eleven-year period at the Sanatorium of the Jewish Consumptives' Relief Society. Of 1,316 admissions in this period, 61 patients had some form of genital tuberculosis, an incidence of 4.7 per cent. In a proposed classification for genital tuberculosis, based on the clinicopathological interpretation of the lesions and their response to treatment, 8 of the 61 cases were classified as catarrhal, 21 as ulcerative and 32 as fibroid. In 15 cases in all of the latter two classifications there was an associated renal tuberculosis, a percentage of 24.5. In the series, 34 patients, or 55.7 per cent, had tuberculous lesions elsewhere than in lungs and kidneys, strengthening the theory of the haematogenous route of infection for genital tuberculosis. The authors recommend ultraviolet ray therapy in preference to surgical treatment, and report encouraging results in the treatment of the catarrhal and ulcerative types. The quantitative and qualitative spectrum output of a commercial source of ultraviolet ray is an important consideration, since certain sources of radiation capable of producing erythema in a comparatively short time have little therapeutic value. The authors prefer to use the so-called cold quartz lamp.—*Genital Tuberculosis, E. A. Miller & M. J. Lustok, J. A. M. A., October 7, 1939, cxiii, 1388.*—(*G. L. L.*)

Placental Tuberculosis.—Tuberculosis of the placenta occurs infrequently. Only 44 cases had been reported in the literature up to 1922. Since that date there have been no reports in the American literature. The history of one patient with tuberculosis of the placenta is reported. The patient had a spontaneous and normal delivery of a child who shows no evidence of tuberculosis and in whom the Mantoux test has long been negative. The diagnosis was confirmed by the demonstration of acid-fast bacilli in a typical caseating tubercle which was found in the placenta.—*Tuberculosis of the Placenta, G. Schaefer, Quart. Bull. Sea View Hosp., July, 1939, iv, 457.*—(*A. A. E.*)

Bone Tuberculosis.—In 1920 Jüngling called attention to a previously unknown form of bone tuberculosis involving the hands and feet and usually occurring in children or about puberty which he called *osteitis tuberculosa multiplex cystica*. Earlier, Koenig described a symmetrical form of bone tuberculosis with bone resorption and cyst formation. Before Milgrim's review these cyst-like lesions were thought to occur only in the bones of the hands and feet and the coexistence of more than one uncommon site in the same patient, such as the shaft of a long bone and bones of the skull, was regarded as a rarity. It is possible that neither the cystic character nor the diffuse involvement of various types of bones is as unusual as case reports seem to indicate. Hodges and Phemister have completely described the usual manifestations of bone and joint tuberculosis and these are briefly reviewed. The two chief pathological types described by Harrison are noted; the first in which soft granulation tissue occurs without caseation, leading to bone absorption of the molecular type resulting in no actual bone destruction, and the second in which there is marked softening of the bone, trabecular absorption and caseation leading to suppuration. The course, pathology and X-ray findings of the various types of tuberculosis of the joint, spine and skull are described. Twenty-one cases are then reported that are of interest because of the varied age incidence, the wide-spread, varied and bizarre destructive bone lesions and the absence of characteristic changes indicating the true nature of the disease process. Of the 21 cases, 15 were males, and 18 were colored. The ages ranged from nine to fifty-five years. The average duration of symptoms was two years. In only 2 was there an associated pulmonary tuberculosis. One had a positive Wassermann. Many of the cases resembled metastatic malignancy and often showed

the extensive dissemination of malignancy. Others resemble a syphilitic bone lesion in which periostitis is considered a diagnostic feature and the association of cortical destruction helps at times to differentiate it from forms of osteomyelitis in which it is not pronounced or is absent. Individual lesions also occur resembling primary bone tumors, fungus infection or when associated with a cold abscess, parosteal fibrosarcoma. In another instance, in the absence of a cold abscess, the tuberculous lesions of the spine resemble a giant cell tumor, erosion of the body of the vertebra by an aneurism or other transmitted pulsations and nontuberculous infections. One of the most difficult situations was the differentiation of atypical wide-spread bone destructive lesions in a proved case of malignancy. The final diagnoses made were confirmed by autopsy in 10, by biopsy in 5 and by aspiration in one case.—*Unusual Manifestations of Bone Tuberculosis, B. P. Widmann, H. W. Ostrum & R. F. Miller, Radiology, April, 1939, xxxii, 434.*—(*G. F. M.*)

Cystic Tuberculosis of Bones.—There is presented a case report of this condition, presumably the twelfth in the pediatric literature.—*Multiple Cystic Tuberculosis of the Bones, D. W. Martin, J. Pediat., August, 1939, xv, 254.*—(*M. B.*)

Cystic Tuberculosis of Bone.—Further observations on a rare case of cystic tuberculosis of many bones in an eight year old child are recorded. Roentgen study of the course of these lesions during a two-year period is reported. It is briefly pointed out that this disease occurs in both the adult and the child.—*Multiple Cystic Tuberculosis of Bone in a Child, J. L. Law, Am. J. Dis. Child., May, 1939, lvii, 1072. (Author's Summary)*—(*M. B.*)

Surgery in Knee Joint Tuberculosis.—Twenty-one years of experience in knee joint fusions at the New York Orthopedic Dispensary and Hospital is presented. One hundred ninety-nine of these cases have been followed from one to seventeen years after operation with an average follow-up period of five and one-half years. A "U" shaped incision was used to widely expose the knee joint surfaces. The menisci and articular cartilages were removed promoting direct bony contact between the femur and tibia. The patella was denuded of cartilage and periosteum and placed in the slots prepared for it in the tibia and femur without changing its axis. The child's knee was placed in 180 degrees extension to prevent strain on the lower femoral epiphysis. The adult's knee was placed in 10 degrees flexion. Fusion took place and the cast was dispensed with at an average period of eight months after operation. The disease subsided in all but 7 of those in which fusion took place. At the time of operation 59 patients were ten years of age or less and 14 were five years or under. Leg length measurements were made in 93 cases. Of these, 76 had shortening varying from a fraction of one inch up to five inches with the general average being one inch. In 19 children slipping of the lower femoral epiphysis occurred. Other complications were minimal. On the basis of his experience with operative arthrodesis of the knee joint for tuberculosis the author recommends this procedure for both children and adults. In no other joint in the body has such a high percentage of successful fusions been attained.—*Knee Joint Tuberculosis: 222 Patients Treated by Operative Fusion, J. W. Toumey, Jr., Surg., Gynec. & Obst., June, 1939, lxviii, 1029.*—(*F. J. P.*)

Tuberculosis of Knee Joint.—It is in the years of growth, while epiphysial cartilages are still present, that there is a lack of agreement as to the place of surgical measures in the treatment of tuberculosis of the knee joint. During the period from birth to epiphysial closure, any surgical measure which encroaches on the articular portions of the tibia and femur has been looked on with distrust by the majority of surgeons. The author discusses the results of a total of 137 years of conservative treatment employed for 46 patients. The most frequent age of onset was found to be within the first four years of life. Fifteen patients, or 31.9 per cent, presented a bone abscess in the metaphysial or epiphysial region of the tibia or the femur early in the disease. One patient remained well, with a normal knee joint for eight years after extra-articular excochleation of an osseous focus. In 5 other patients this procedure failed. Conservative treatment accomplished no satisfactory results in the remaining 46 patients. The author then compares with these results the after-history of 39 patients subjected to an "economical resection" aimed at producing a femorotibial synostosis. The majority of the resections were carried out between the sixth and eighth years. On the oldest the operation was performed at ten years of age, on the youngest at seventeen months. On the latter case the operation failed completely, resulting in motion. Resection healed the tuberculosis, however, in 32 of 34 patients, or 94.1 per cent, whom it was possible to follow for from one and a half to thirteen years. The knee joint of a child ankyloses very readily after resection, and

the percentage of successful fusions resulting from a single operation is as high as that for ankylosing operations on any other joint. Extreme shortening after economical resection in infancy and childhood is not the rule; any marked degree occurred in only 30 per cent of the patients. In these it usually resulted from causes extraneous to the resection. Severe aberrations of directional growth were associated in most instances with previous damage to the epiphyses. They occurred in only one-third of the patients, and were readily correctable by osteotomy. From this evidence it seems reasonable to conclude that economical resection should not be withheld until the age of fifteen from children suffering from tuberculosis of the knee joint.—*Tuberculosis of the Knee in Infancy and Childhood, F. M. McKeever, J. A. M. A., September 30, 1939, cxiii, 1293.*—(*G. L. L.*)

Tuberculosis of Symphysis Pubis.—Although Bean, of Salem, Massachusetts, described a case encountered in his own practice in 1930, and comprehensively reviewed the literature, no subsequent reports have appeared in the English literature and it is not mentioned either in orthopedic or general medical textbooks. A few previous cases have been described mostly in foreign language journals. Alpert here reports 4 cases from the Lakeville State Sanatorium, Massachusetts and describes the operative procedure followed in 2 of them. Most commonly noted are irregular gait, tumor mass and pain in the region of the pubic symphysis. In the Lakeville cases the tumor mass appeared oftenest in the groin or over the pubis. It may simulate hernia or psoas abscess. None of the patients showed irregular gait. One patient had pain in both groins and one pain in the left hip. Three of the patients were elderly males, the fourth an adolescent girl. One, a Negro of 47, had a previous fusion of the symphysis with a bone graft which broke down. In the last case, a girl of fifteen, curettage and bone grafting were also resorted to, with eventual healing after sequestration. Evidence of inactive thoracic tuberculosis was found in two of the cases. Definite bone destruction was roentgenologically apparent in all, with later new bone formation. The cartilage in the symphysis pubis was also affected. The articulation between the pubic bones is an amphiarthrodral joint with a thin layer of hyaline cartilage and an intermediate layer of fibrocartilage. Normally the ligaments resist separation but, when diseased, there is considerable stress and strain and the infection not only destroys the cartilage but increases the space. The ultimate result to be sought is bone regeneration and ankylosis. However, bone grafts applied directly in a tuberculous field are prone to slough out. Therefore, surgical fusion of the sacroiliac joints was applied by Adams in 3 cases in two stages. This gives the advantage of a clean field, indirect immobilization and the operation is not long or shocking. These patients were later able to carry on an active life.—*Tuberculosis of the Symphysis Pubis, L. Albert, New England J. Med., May 11, 1939, ccxx, 792.*—(*A. P.*)

Operation of Tuberculous Coxitis.—This new procedure was devised to overcome the poor results due to the difficulty in maintaining immobility, incomplete ossification in children and reflex compression and shearing forces from the pull of the iliopsoas and the adductor muscles seen both in conservative treatment and the usual intratrochanteric fusion operation. In order to overcome the muscular forces the author performed a subtrochanteric osteotomy with consequent distraction and displacement of the fragments using silk suture which he feels promotes ossification and calcification. Immobility was maintained by a double plaster cast. The operation was performed in 16 children and 1 adult. There were 7 acute cases. Following the osteotomy excessive atrophy develops followed by rapid recalcification. Early weight-bearing hastens calcification. The average period for complete healing was eighteen months. There was no recurrence during five years. This procedure could be used at any stage, at any localization and at any age, except where a fistula is present.—*A New Operative Treatment of Tuberculous Coxitis in Children, A. Farkas, J. Bone & Joint Surg., April, 1939, xxi, 323.*—(*M. A. B.*)

Treatment of Joint Tuberculosis.—Joint tuberculosis is essentially a disease of childhood and early adult life. In a study of 310 patients, 68 per cent were less than thirty years of age at the time of admission to the Sea View Hospital and the highest mortality was in the third decade. There is still the failure to consider patients with joint tuberculosis from the standpoint of their general infection and because comparisons of conservative or surgical treatments are difficult unless a uniform classification is utilized the author presents the following classification with the respective group mortality percentage: (A) patients with no evidence of pulmonary tuberculosis, 11.2; (B) patients with arrested pulmonary tuberculosis with negative sputum and no metastatic spread to other organs, 7.5; (C) patients with pulmonary tuberculosis with

positive sputum, 40.5; (D) patients with pulmonary tuberculosis with negative sputum with metastatic spread to other organs, 61.5. In group A death was most often due to prolonged suppuration and amyloid disease. In group D death was due to the overwhelming involvement of other organs with no relation to operative intervention which was often done just to offer relief from pain. In the racial groups the mortality diminished in the following order: Puerto-Ricans, Irishmen, Negroes, Germans, Americans, Italians, Jews. Ninety-five per cent of involvement occurred in the weight-bearing joints of which the spine was involved in 52.4 per cent. The upper extremity was involved in 5.5 per cent and the elbow had the highest incidence. Because the weight-bearing joints were involved in such overwhelming proportion it is felt that small traumata play some predisposing part in the invasion of the joints by tubercle bacilli. In 77 per cent of 157 available joints the diagnosis was confirmed by the study of tissue or exudate. The greater incidence of spinal involvement occurred between the seventh thoracic and the fourth lumbar vertebrae with the maximum at the eleventh thoracic. Spinal fusion and prolonged bed-rest is the best treatment. Spontaneous fusion was noted in 24 per cent of cases. The knee is the simplest joint to treat surgically. The hip joint was involved at an earlier age than other joints with an incidence of 37 per cent under ten years and 82 per cent under thirty years of age. Fusion of this joint is often impossible but in 87.5 per cent of cases good bony fusion was obtained. Sacroiliac tuberculosis has a high mortality because the patients are usually in groups C and D. Amputation of the tarsal and ankle joints was recommended where wide-spread destruction with draining sinuses has resulted. Fusion of both sacroiliac joints was successful in two cases of tuberculosis of the symphysis pubis. Sixty-six per cent of excellent result with a low mortality was obtained in upper extremity joint involvement. Resection of the elbow joint was found to give a better result than fusion. Patients with multiple joint involvement show a higher average mortality and a lower average of excellent results. Of the entire series, 55 per cent showed an excellent result, 18.8 per cent had uncertain results, and 26.1 per cent died. The author feels that all treatment should aim at complete rest of the joint and many deaths of patients in group A can be prevented by earlier operative intervention. A marked reduction in mortality in group C gives encouraging evidence of what collapse therapy and joint surgery can accomplish.—*Surgical Treatment of Joint Tuberculosis, M. Cleveland, J. Bone & Joint Surg., July, 1939, xxi, 607.*—(*M. A. B.*)

Middle Ear Tuberculosis.—The middle ear can be the site of a primary tuberculous focus. This infection, which arrives by way of the eustachian tube, occurs almost always in very young infants. It is seen very rarely. The clinical picture is typical and is characterized by a discharging ear and enlargement of the draining lymph nodes, particularly the preauricular nodes. In connection with the age of the child and the positive tuberculin reaction, the diagnosis can usually be made with great certainty even without demonstration of the tubercle bacillus. Facial paralysis is seen in one-quarter of these cases. In the Lübeck incident, where newly born infants were infected with virulent organisms, 21 such cases were observed; 9 of these died. The primary infection of the middle ear will depend to some degree on the structure and patency of the eustachian tube. The pathogenesis of postprimary middle ear tuberculosis is more varied but falls mainly into two large groups: middle ear infection in the course of phthisis together with evidence of intracanalicular spread such as bronchogenic dissemination, and laryngeal and intestinal tuberculosis; middle ear disease in association with haematogenous pulmonary tuberculosis and other haematogenous manifestations such as bone and kidney foci and meningitis. The first type is more common in adults, the second in children. Further classification includes middle ear disease as the only clinically active manifestation of tuberculosis (isolated organ tuberculosis) and lymphogenous infection. Finally, exogenous superinfection through the auditory tube or a perforated ear drum is possible but extremely rare. The pathogenesis of the otitis is often obscure, particularly in cases manifesting both intracanalicular and haematogenous disseminations elsewhere. In cases of haematogenous tuberculosis with tuberculous otitis, ending with meningitis, the possibility of the ear rather than the blood-stream as the source of the meningitis should always be considered. Isolated middle ear tuberculosis, not accompanied by active tuberculosis of any other organ, is always of blood-stream origin. It is primarily a disease of childhood with a varied and often atypical course. Haematogenous otitis may begin either in the mucous membrane of the ear or in the surrounding bone. It is generally believed that the former is more common. Lymphogenous infection arises by retrograde extension from tuberculous cervical lymph nodes; an illus-

trative case record is cited.—*Über die Stellung der Mittelohrtuberkulose im Ablauf der tuberkulösen Infektion, R. W. Müller, Klin. Wchnschr., January 28, 1939, xviii, 127.—(H. R. N.)*

Primary Tuberculosis of Skin.—Two cases of this rare type of primary complex are reported from clinical, pathogenic and immunobiological viewpoint. In the first case a woman of twenty-two years of a tuberculo-negative family developed a tuberculous inguinal adenitis a few weeks after intercourse with a man who over eight months before had been subjected to nephrectomy for renal tuberculosis. Freshly excreted urine of this man gave a positive tuberculin reaction in guinea pigs. The author feels that this case represents a primary tuberculosis of the mucosa of the vulva which showed a round ulcer and of the inguinal lymph nodes. He believes that there exists a primary tuberculosis of the genital organs on a venereal basis and that this lesion may simulate various other venereal infections and even sometimes mingle with some of them. The second case is that of a man aged nineteen of a nontuberculous family who immediately following a primary tuberculous complex of the skin of the face presented an eruption of lupus nodes at and around the site of the primary infection. A few weeks previously in a public swimming pool the patient had contracted a small excoriation of the facial skin which bled slightly and of which no trace could be found at the first medical examination. At the time of this accident an incidental Mantoux test was negative up to 1 mg. whereas it became positive five weeks later with a dose of 1 to 1000. The author feels that the reaction of the tissue to the tubercle bacilli which subsequently assumed the character of lupus may be explained in this case by the fast course and by the well marked allergic reaction in a case of a definitely preceding skin lesion and that this represents an inoculation following a superficial wound. Early disappearance of the primary lesion and absence of tubercle bacilli illustrate the important pathogenetic part of immunobiological agents and distinguish this case from other lupus lesions.—*Contribution à la connaissance de l'infection tuberculeuse de la peau et de la muqueuse, S. Hellerstroem, Acta Dermat. Venereologica, May, 1939, xx, 276.—(F. G. K.)*

Papulonecrotic Tuberculosis.—Five cases with biopsy findings are described. The probable mechanism of cutaneous exanthematous tuberculosis is discussed. Dissemination of either the tubercle bacillus or some phase of its life cycle must occur in a patient in whom tuberculosis has produced the immune allergic state. The type of cutaneous lesion depends upon the site of embolism and the clinical picture varies with the amount of arterial damage. While the various tuberculids have different gross morphological descriptions they are merely variants of one another. The difference between a lichenoid tuberculid, a papulonecrotic tuberculid and erythema induratum (*tuberculosis indurativa*) is merely a matter of relative tissue involvement, and one or all varieties may occur simultaneously in the patient. The prognosis for patients with tuberculids depends upon the internal lesion and not upon cutaneous manifestations which usually involute without other sequelae.—*Papulonecrotic Tuberculosis in Children, J. C. Bernstein, Am. J. Dis. Child., June, 1939, lvii, 1260.—(M. B.)*

Tryptophan in Tuberculous Meningitis.—The tryptophan test was used on 202 spinal fluids to try to differentiate tuberculous meningitis from other forms of meningeal irritation. The test proved negative when theoretically it should have been positive in over 60 per cent of the cases of tuberculous meningitis and was positive when it should have been negative in over 23 per cent of the cases of nontuberculous irritation. It is concluded that the test is valueless.—*Tryptophan Bodies in Tuberculous Meningitis, J. A. Toomey, R. P. Fulton & F. W. Rea, J. Pediat., March, 1939, xiv, 373.—(M. B.)*

Blood and Spinal Fluid in Meningitis.—In the normal subject variations in the cerebrospinal fluid sugar content are dependent on variations in the blood sugar level, but changes in the latter are not immediately reflected in the cerebrospinal fluid. The lower limit for cerebrospinal fluid sugar content in normal cases in 50 mg. per cent and the ratio of cerebrospinal fluid sugar to blood sugar 0.6. In tuberculous meningitis, the cerebrospinal fluid sugar content is reduced as is also the ratio of cerebrospinal fluid sugar to blood sugar; the reduction in both becomes more marked as the disease progresses. If convulsions occur, the cerebrospinal fluid sugar level may be raised to apparently normal limits, but the blood sugar is also raised and the ratio of cerebrospinal fluid sugar to blood sugar remains below normal. In meningococcal meningitis, the cerebrospinal fluid sugar is reduced and may be almost entirely absent and the ratio of cerebrospinal fluid sugar to blood sugar is below normal. As recovery takes place, the cerebrospinal

fluid sugar content and the ratio of cerebrospinal fluid sugar to blood sugar return to normal. The cerebrospinal fluid chloride content is reduced in all forms of meningitis but this is due to a reduction in the blood chloride content. Chloride reduction in the early stages of tuberculous meningitis is less constant than reduction in the cerebrospinal fluid sugar content.—*The Blood and Spinal Fluid Sugar and Chloride Content in Meningitis, Esther Hendry, Arch. Dis. Childhood, June, 1939, xiv, 159.* (*Author's Summary*) —(*M. B.*)

Primary Tubercle.—The reaction of virgin pulmonary tissue to the tubercle bacillus, the primary complex, is made up of three anatomical entities. These are the tubercle that develops in the lymphoid tissue at the portal of entry, the lymphatic channels that drain it and the regional lymph nodes. Earliest cellular reaction may be studied by experimental methods. The first reaction is typically inflammatory and differs in no way from that produced by other insoluble particulate irritants of similar size and indestructibility. The tubercle bacillus is less irritant than many dusts. Although inflammation is inconspicuous and transient, capillaries are dilated, serum appears in the alveolar spaces, and there is an escape of erythrocytes, polymorphonuclear and mononuclear cells from the blood-stream. Active phagocytosis occurs and within six hours it is difficult to detect an extracellular bacillus. Within twelve hours, bacilli-laden phagocytic cells can be identified in subpleural, perivascular and peribronchial situations, as well as in the regional tracheobronchial lymph nodes. Tuberculous lesions develop wherever intracellular bacteria are deposited in the course of their journey from the lung parenchyma to the regional lymph node. With the tubercle, the subsequent reaction differs from that produced by particulate matter. Within ten hours, polymorphonuclear cells become fewer, disappearing in twenty-four hours and mononuclear cells increase in number and importance as a phagocyte. Within three to seven days necrotic changes occur in the centre of the tiny nodule and progress to include the peripheral cells. Before the end of two weeks the mononuclear cells have increased in number and size and arrange themselves radially in solid concentrations. Giant cells appear. A mantle of granulation tissue develops about the tubercle. Whether the tubercle is obliterated or becomes a focus for dissemination depends entirely on the balance between establishment of fibrosis and caseation and necrosis. The production of tubercles along the lymphatics and in the lymph nodes proceeds in a similar manner. The bacillus or its waxy envelope or the chemical fractions released by its death are sufficiently active irritants to be responsible for the necrosis of phagocytic cells present during the first week following primary infection. It is a reasonable hypothesis that proliferation and coagulation necrosis represent purely nonspecific reactions of cells to irritation and are common to many organic and inorganic particles. Before accepting the theory that ferments derived from dead polymorphonuclear cells contribute to cellular degeneration, it is well to remember that there should be more enzymes released from polymorphonuclear cells in cases of experimental silicosis, yet less necrosis is associated with silicosis than with tuberculosis. Sensitization of cells begins soon after contact with the bacillus, increases with passage of time, and usually can be demonstrated within two or three weeks when it is sufficiently developed to produce inflammation of reinfection by specific organisms. Focal allergic manifestations of secondary infection are not different, but are intensified reactions frequently produced at first contact of tissue with tubercle bacilli or other irritants. If focal cellular sensitization can develop to a high degree within three to five days, local allergy may occur much earlier than can be demonstrated by reactions to tuberculin, and therefore, proliferation and signs of cellular necrosis are due to allergy. Healing of the tubercle occurs by calcification and rarely ossification.—*The Formation and Development of the Primary Tubercle in the Lung, W. S. Lemon, J. Thoracic Surg., April, 1939, viii, 371.*—(*L. F. B.*)

Tuberculous Infection and Reinfection.—A selected group of 130 cases with a definite history of massive tuberculous contact was chosen from 1,000 autopsies. A system of morphological analysis of tubercles permitted an estimation of their ages between six months and twenty years within an accuracy of 25 per cent. By such a study of the age of the tubercles as well as their position, and clinical and X-ray studies, 57.1 per cent of the cases appeared to develop from a primary infection as a result of massive dosage, which continued as a progressive endogenous process, or in stages as exacerbations of the primary lesion. There were about 17.5 per cent probable endogenous and 25.4 per cent exogenous reinfections or infections of indeterminable origin. The latent period between primary infection and clinical disease averaged 10 years, and ranged from 18.5 years to 3.5 years. The clinical disease in

all cases averaged 3.5 years. There were 35.7 per cent primary infections after fifteen years of age, most of which differed considerably from childhood infections by tending to localize in the parenchyma of the upper parts of the lung with a small lymph node process, slowly forming a capsule and tending to be more necrotic and less calcified. The mode of onset was catarrhal or insidious, and in about half it was abrupt. Of 23 pregnant women, 12 went directly from parturition into tuberculosis, and 8 had a period of good health lasting from one to five years. Of 353 brothers, sisters and children of open cases, only 63 per cent became ill or died within twelve years after infection. Perhaps, as a result of public health measures, there is a marked decrease of childhood infections with a shifting of first infection into adult life. There seem to be two types of primary tuberculous infection; first, that caused by a massive dosage obtained in close contact and leading in 25 per cent of the cases directly to death, and second, that caused by smaller dosage, followed usually by small healed foci, and probably an increased resistance. In thickly populated regions it is, therefore, probable that mortality and perhaps also morbidity in the first half of life are due largely to an endogenous progression of the disease. In the second half of life, there are more small healed lesions with a gradual loss of early immunity and therefore a corresponding increase of exogenous reinfections.—*Recent Studies Bearing on Tuberculous Infection and Reinfection, H. C. Sweany, Acta tuberc. Scandinav., Fasc. 1–2, 1939, xiii, 67.*—(*F. B. S.*)

Healing of Cavities.—Cavitation in pulmonary tuberculosis is an important factor. Physiological and pathological studies indicate that the same processes occur in spontaneous healing and when active collapse is used. Two ways in which a cavity may heal were recognized by Laennec and Latham; there may be an ingrowth of an epithelial lining after the disease has been replaced by granulation tissue and fibrosis or the diseased area may be replaced by fibrous scar tissue. Modern authors have also described these modes of healing. The question arises as to whether a cavity may heal in any other way. Cases have been reported which would suggest that healing may occur by shrinking and calcification of caseous material present in the cavity with following occlusion of the bronchial lumen. Coryllos was among those who stressed the importance of obliteration of the bronchial lumen in the clinical healing of cavities. Kinking of the bronchus is regarded as a common cause, but other factors include oedema of the wall, tuberculous granulation tissue, fibrous stenosis and obstruction by a plug of caseous material. The authors report 4 cases giving radiological and histological evidence found, supporting this conception of cavity healing and indicating the probable early and late stages of the process. —*The Healing of Cavities, W. Pagel & F. A. H. Simmonds, Am. J. M. S., March, 1939, cxcvii, 281.*—(*G. F. M.*)

Pulmonary Arterial Circulation.—Physiologically efficient respiration, all other factors assumed to be normal, is directly proportional to the efficiency of the pulmonary arterial blood supply. Therefore, it becomes imperative to know the effect of disease and of collapse therapy on the pulmonary circulation. Since differentiation of the finer branches of the pulmonary and bronchial arteries is often difficult or impossible by gross or microscopical observation, studies were made of the pulmonary circulation following the injection of the arterial system with radio-opaque material. To do this, the thoracic contents were removed *en masse*, where indicated the parietal pleura was also removed intact, and the heart and aorta dissected free. Roentgenograms were then made of the lungs before and after injection. Following this the lungs were deflated and then re-expanded to their former volume with Kaiserling-I and fixed. Gross and microscopical studies were later made and roentgenograms taken of serial sections. One hundred and seventy lungs were thus studied which were classified in the following groups: (*1*) untreated pulmonary tuberculosis, (*2*) pulmonary tuberculosis treated by collapse measures, (*3*) complications of pulmonary tuberculosis, and (*4*) nontuberculous pulmonary diseases. In the normal lung uniform filling of the major trunks, arterioles and the first portion of the capillary bed occurs. A narrow zone of diminished circulation is seen surrounding small tuberculous foci and little demonstrable alteration in the arterial circulation is visible in acute exudative tuberculosis where the lesions are discrete and small. However, in larger areas of consolidation, where tissue destruction is present and small cavities are formed, a definite diminution in the size of the larger vessels occurs and an absence of the fine branches normally present is evident. The fine branches are almost completely obliterated and the large trunks greatly reduced in size in areas of tuberculous pneumonia, vessels of medium size often appearing to end abruptly. Thus it has been noted that the degree of change is in direct proportion

to the amount of tissue destruction. Cases showing all degrees of healing are present in the material studied including a group of patients receiving collapse therapy for cavities in whom the burden of respiration was thrown on the scarred areas. These patients were markedly dyspnoeic. In this group, a striking diminution in the pulmonary arterial circulation was observed. The findings have been so constant that the authors believe that it is possible to estimate the efficiency of the lungs from the amount of scar visualized in the X-ray films and contend that a proper evaluation of such scarring will warn against collapse measures in patients who have large areas of fibrosis and calcium deposits indicating former extensive involvement. No vascular changes were noted in miliary tuberculosis. The effect of collapse therapy on the circulation was found to be in direct proportion to the degree of collapse. Slight collapse produces only slight diminution in the injected material in the finest branches. With a greater degree of collapse, the larger trunks become tortuous, lie close to each other, but are well filled, and with complete or almost complete collapse the larger vessels show a definite reduction in size. When reëxpanded there is normal vascular filling in areas unaffected by disease. In the collapsed lung the areas of tuberculosis show circulatory changes similar to those described in uncollapsed lungs, but the changes are more evident because of the crowding together of vessels. Vascular changes in silicosis depend upon the stage of the disease. Lungs showing small discrete nodules have a normal vascular tree; where lesions are larger, there is a marked decrease in circulation. This decrease is probably one of the major causes of dyspnoea. In pneumonia, circulatory changes also vary with the stage of the disease. A slight increase in the width of the smallest arteries is present in early consolidation, but a progressive decrease in the small vessels occurs as gray hepatization approaches. In a few cases of advanced pneumonia areas of complete avascularity were noted and sections revealed areas of necrosis and abscess formation. Following embolism avascularity occurs in the infarcted areas. Later, in the excavating stage, scant material is present about the cavity and a definite decrease in blood supply is present in the final scar. The authors conclude that pulmonary tuberculosis results in a marked decrease in the pulmonary arterial circulation in the portion of the lung affected which is proportionate to the degree and stage of involvement, that this alteration is permanent, that collapse measures decrease the total volume in proportion to the degree of collapse, but that the circulation returns to normal when the lung reëxpands. Twenty-eight plates are presented representative of the study.—*Roentgen Visualization of the Pulmonary Arterial Circulation in Autopsy Material, C. C. Birkelo & W. L. Brosius, Radiology, September, 1938, xxxi, 261.*—(*G. F. M.*)

Pulmonary Veins.—The pulmonary veins have received less study than the arteries. Because of their distribution and structure, they are relatively inconspicuous on teleoroentgenograms. Postmortem roentgenological studies were therefore made after injecting barium sulphate into the pulmonary venous system. The material was injected into the left auricle and pulmonary veins under fluoroscopic control, with the organs *in situ*. One subject had a normal heart and the other had rheumatic heart disease. The results were then compared with planographic studies of the chests of two living persons with essentially the same cardiac conditions. The location of the pulmonary veins and the left auricle in the postmortem preparations compared well with that of living persons and it was noted that the pulmonary vessels can be studied more advantageously in the planographic X-ray film than with ordinary roentgenograms. Therefore, the former should make it possible to study more thoroughly the condition of the pulmonary veins.—*Roentgenographic Demonstration of the Pulmonary Veins, B. S. Epstein, Radiology, October, 1938, xxxi, 418.*—(*G. F. M.*)

Boeck's Sarcoid.—The patient was an eighteen year old Negro whose symptoms began six weeks before admission with progressive fatigue and dyspnoea on exertion. The heart was definitely enlarged. Chest X-ray film showed thickening of the hilum of each lung with heavy infiltration radiating toward the periphery. The reaction to 0.1 cc. of Old Tuberculin (1:100) was negative. Right ventricular failure became more marked, auricular fibrillation, complete heart block and shifting pacemaker developed. He died one month after admission, of progressive myocardial failure. At autopsy there was extensive involvement of the spleen, liver, lungs, testes, intestinal wall, and peribronchial and hilar lymph nodes. The lesions were composed of multiple discrete tubercles as well as many confluent groups of tubercles. There were numerous giant cells. No caseation was present. A subcutaneous nodule removed from the left forearm showed the same histology. The myocardium was extensively involved by chronic inflam-

matory granulation tissue in which there was fibrosis but no caseation. The epicardium had been entirely spared. All the evidence seemed to point to a diagnosis of Boeck's sarcoid.—*Boeck's Sarcoid, E. F. Cotter, Arch. Int. Med., August, 1939, lxiv, 286.*—(*H. R. N.*)

Boeck's Sarcoid in Brothers.—This is a report of Boeck's sarcoid in two brothers. Both showed a marked enlargement of the hila, discovered by routine X-ray examination. The younger brother had previously had a cold, the other had been apparently always in good health. Both were asymptomatic and afebrile. Early, the physical findings in the lungs were minimal and nonspecific, later absent. A slight leucopenia was present, eosinophiles and monocytes were not increased. The elder brother showed in the course of his disease a hyperglobulia of nearly 7,000,000, a finding which has been observed in certain cases of Boeck's disease with involvement of the spleen. He had a slightly positive Pirquet, his brother having repeatedly a negative reaction. It was not possible to detect other manifestations of the disease. The two X-ray films showed a marked similarity. This has been the second report of a familial occurrence of the disease which seems to speak in favor of a constitutional factor.—*Familiäres Vorkommen der Besnier-Boeck'schen Krankheit, M. Dressler, Schweiz. med. Wchnschr., March 25, 1939, xii, 269.*—(*A. B. T.*)

Anatomy of Bronchi.—Recent advances in radiology, bronchoscopy and thoracic surgery have made it necessary to simplify the anatomical description of the bronchial tree; and to this end the authors propose a new nomenclature based on what they term "broncho-pulmonary segments." In this there are twelve names, each applied to a bronchus with the roughly pyramidal segment of pulmonary substance which it supplies. For the right lung these bronchi are named in the order in which they leave the bronchial tree as follows: upper lobe (4), subapical, apical, axillary and anterior; middle lobe (2), anterior, axillary; lower lobe (6), apical, cardiac, subapical, anterior basal, axillary basal and posterior basal. The main bronchus is treated as a unit reaching from the bifurcation of the trachea to the terminal forking into the axillary basal and posterior basal segmental branches; and the part of it from which the segmental bronchi of the upper (and middle, right) lobes arise is known as the "vestibule." Four diagrams of the right lung are supplied showing these bronchi and the subdivisions pertaining to them. By appropriate enlargement of these on sheets of cellophane we have charts which may be superimposed upon the usual anterior, posterior, lateral and mediastinal X-ray films to permit of the ready recognition of the various bronchopulmonary segments and the precise localization of any pathological foci which they may contain. The adoption of this terminology would make unnecessary the use of indefinite adjectives such as primary, secondary and tertiary. We have only to keep in mind (*1*) main bronchi, (*2*) vestibules, and (*3*) segmental bronchi.—*The Anatomy of the Bronchial Tree, J. H. Neil, W. Gilmour & F. J. Gwynne, Brit. M. J., March 11, 1939, 495.*—(*C. C. M.*)

Athlete's Lung.—This is a study of the anatomical changes that occur in the rat lung after strenuous exercise. The animals, dead either from exhaustion or from ether, were put whole into 10 per cent formalin and left there for three or four days before the thorax was opened. In the acute experiments eight rats swam in water varying periods of time of from 72 to 420 minutes. There was found to have occurred an increase in both relative and absolute lung volume. This varied with the animals' ability as swimmers. Histological studies showed the presence of a marked emphysema. The alveolar walls were thin and frequently torn. Twenty-five rats were made to swim daily until they were visibly tired. Control animals for this series were made to swim for ten minutes daily for a period of eight to sixty-seven days. In the former animals "athlete's lung" appeared after thirteen weeks. The alveolar septa became thickened, and infiltrated with small and large round cells. There was a thickening and an increase in the amount of smooth muscle present in the lungs. Apparently a true hyperplasia had taken place. In the lungs of 5 rats that swam thirty minutes daily for from twenty-three to thirty-seven days the alveoli were dilated and new lung vesicles were forming. In the lungs of 12 animals which swam from two and one-half to five hours daily for from six to forty days there were many more dilated alveoli, and evidences of formation of new alveoli appeared earlier. In those animals which died spontaneously ten minutes to six hours after removal from the water there were present varying degrees of bronchitis and peribronchial cellular infiltration. The author observes that athlete's lung develops more slowly than athlete's heart. The return to normal of the lungs was likewise found to occur more slowly and less completely than was the case with the rat heart. The return towards the normal of the changes in the

lungs of the animals subjected to the long term experiments took approximately one hundred and seventy days. The changes produced in the acute experiments were resolved in seven days.—*Tierexperimentelle Studien über die Sportlunge und ihre Rückbildungsfähigkeit, W. Nürmberger, Virchows Arch., December, 1938, cccliii, 303.—(C. L. D.)*

Bacillaemia in Experimental Tuberculosis.—During a period of one to three months, during which daily tests of femoral arterial blood were made, at least one positive test for tubercle bacilli was found in 15 out of 17 dogs injected intravenously with the bacilli. Dogs dying of progressive tuberculosis showed the heaviest and most frequent periods of bacillaemia.—*Occurrence of Sporadic Bacillemia in Experimental Tuberculosis in Dogs, J. S. Howe, Proc. Soc. Exper. Biol. & Med., April, 1939, xl, 509.—(F. B. S.)*

Bacillaemia in Experimental Tuberculosis.—Tubercle bacilli were detected by guinea pig inoculation in the femoral arterial blood of dogs which had been injected intravenously or subcutaneously with human tubercle bacilli (H37). The bacillaemia occurred periodically.—*Periodicity of Sporadic Bacillemia in Experimental Tuberculosis in Dogs, J. S. Howe, Proc. Soc. Exper. Biol. & Med., June, 1939, xli, 575.—(F. B. S.)*

Bacillaemia in Experimental Tuberculosis.—This work was carried out in several laboratories under the Public Health Department of the London County Council in order to check with previous rather conflicting reports concerning both tuberculous human beings and experimental animals. In the present study, 47 blood samples were examined, 36 from animals infected with tuberculosis and 11 from human patients, all advanced, sputum-positive pyrexial patients. The animal specimens were examined by Löwenstein's technique (1932) and the human samples some by this method and some by that of Ninni and Bretey (1933). Ten of the 11 human samples and 2 from tuberculous guinea pigs were tested by animal inoculation. For the Löwenstein technique Löwenstein-Jensen's medium was used and for the Ninni-Bretey culture inoculation was made into Sauton's medium in 10 ounce screw-capped bottles with subculture after four weeks on Löwenstein-Jensen media. For animal inoculation 3 guinea pigs were each injected intramuscularly with 2 to 3 cc. of citrated blood and then kept under observation from three to eight months with weekly palpation of the lymph glands. In 11 out of 36 tuberculous animals (34 guinea pigs, 1 rabbit, 1 cock) positive blood cultures were obtained using Löwenstein's technique. The demonstrability of tuberculous bacillaemia by cultural methods in experimental tuberculosis depends on the type of bacillus and probably also on its adaptation to artificial media. Eleven human blood samples from patients with pulmonary tuberculosis proved negative using the culture techniques of Löwenstein and Ninni-Bretey. Two out of 12 blood samples negative in the culture experiment proved positive by animal experiment.—*Bacillaemia in Experimental Tuberculosis, A. Beck, Tubercle, June, 1938, xix, 398.—(A. P.)*

Tuberculosis in Rats.—This study presents several interesting observations as to the immunology and pathology of tuberculosis in mature, male, albino rats. First, these animals are definitely resistant to tuberculosis. In order to infect them it is necessary to inject them intravenously with 1.0 mg. and occasionally 10 mg. of the Ravenel strain of bovine tubercle bacilli of such high virulence that 0.000,01 mg. intravenously kills rabbits with extensive pulmonary and renal tuberculosis in from three to six months. Cutaneous reactions to tuberculin do not appear in normal, immunized and tuberculous rats, and systemic reactions, entirely absent in normal rats and present in immune rats only following an unusually large dose of tuberculin (1000 mg. intraperitoneally), are always present in tuberculous rats as evidenced by the occurrence of illness or death. This susceptibility of tuberculous rats to tuberculin may be increased by injecting animals with heat-killed tubercle bacilli before infecting them. The tuberculin used in this study was approximately one and a half times as potent as the international standard tuberculin. Complement fixing antibodies, present in low titre in normal and tuberculous rats, can be increased by giving infected rats injections of tuberculin and by immunizing normal rats with injections of heat-killed tubercle bacilli. The highest antibody titres, in this study, were found in rats that had received one or two intraperitoneal injections of heat-killed tubercle bacilli subsequent to immunization by a series of subcutaneous injections. Postmortem examinations or rats that die or are killed from two hours to eighteen months after infection reveal characteristic pathological changes: microscopical tubercles develop during the first two weeks invariably in the lungs, spleen and liver and sometimes

in the kidneys; macroscopical tubercles appear in the lungs exclusively, after one month; caseation is never observed although necrotic epithelioid cells may be seen. Immunization of rats prior to infection produces no apparent changes in the pathological lesions. Tubercle bacilli may be demonstrated in the various tissues studied appearing most abundantly in the lungs. Evidence of greater destruction of tubercle bacilli may be noted in rats immunized prior to infection.—*Sensitization, Antibody Formation and Lesions Produced by Tubercle Bacilli in the Albino Rat, E. Hehre & J. Freund, Arch. Path., February, 1939, xxvii, 289.*—(*A. H. C.*)

Tuberculosis in Mice.—In a previous report it was shown that mice may be rapidly and fatally infected by large intravenous doses of virulent bovine and human tubercle bacilli, while avian bacilli produce less extensive lesions. These experiments lead to the possibility of utilizing mice for the differentiation of the three types of tubercle bacilli. Histopathological examination of the lesions of these infected mice were made to determine the differentiating properties of the bacilli. It was found to be possible to differentiate between infections with avian and human strains. Human strains produce a rapid fatal infection in sixteen to twenty days. Mice inoculated with 0.1 mg. of avian strains frequently survived longer than two to three months. In animals which die, the liver and spleen are found to contain numerous lesions, visible only microscopically, while the lungs show a minimal involvement of discrete infiltration and tracheobronchial adenopathy. In mice which die three to four months following the inoculation, lesions are found disseminated throughout the body. In the mice inoculated with human and bovine strains macroscopical pulmonary lesions are numerous and of two types, the nodular and exudative. A rapid caseation is characteristic. The liver shows a few macroscopical lesions in the form of tiny granulations. The spleen is hypertrophied but without macroscopical lesions. —*Caractères des lésions provoquées chez la sourie par les trois types de bacilles tuberculeux, N. Stamatin & F. Bloch, Compt. rend Soc. de biol., June 17, 1939, cxxxi, 695.*—(*M. T. W.*)

Tuberculosis in Mice.—Intracerebral inoculation of white mice has never been employed for the identification of Koch's bacilli except by Sellars and Pinkerton in conjunction with inoculations of leprosy bacilli. They stated that intracerebral inoculations of tubercle bacilli into mice produced extensive cerebral infections, followed from time to time by massive pulmonary metastases. A series of experiments was made, inoculating the three types of tubercle bacilli intracerebrally into mice. The pathogenic strains produced macroscopical pulmonary lesions as well as splenic hypertrophy which was both constant and precocious. Hepatic and renal lesions were never observed even at the one hundred and twentieth day following the inoculation. Clinical cerebellar symptoms were observed when doses of 0.4 and 0.04 mg. of a very virulent bovine strain were used. Small doses (10^{-3} to 10^{-6} mg.) provoked no nervous symptoms. Avian strains produced granulations without a tendency to caseation. Human strains on the other hand tended to produce lesions resembling small abscesses disseminated on the surface of the parenchyma. Bovine tubercle bacilli provoked nodular lesions, more or less confluent, with less tendency to suppuration than the lesions of human tubercle bacilli. With minimal doses, organisms could be found in the liver and spleen in twenty-eight days. Intracerebral inoculations of BCG were harmless. The liver and spleen, while free of macroscopical lesions other than hypertrophy, contained bacilli, detectable by culture, as early as twenty-four hours following the inoculation.—*Infection tuberculeuse de la souris blanche, par voie cérébrale, R. Bequignon, Compt. rend. Soc. de biol., June 10, 1939, cxxxi, 581.*—(*M. T. W.*)

BCG in Guinea Pigs.—The virulence of tubercle bacilli is manifested by the rapidity and abundance of their dissemination and their fixation in the viscera, regardless of the route employed in inoculation. Virulent bovine tubercle bacilli inoculated subcutaneously into guinea pigs reach the neighboring lymph nodes in less than fifteen minutes and are discharged into the blood-stream in thirty to forty minutes. A small dose of the same microörganisms inoculated into the same region invade the corresponding lymphatics in an equally short time but generalized dissemination via the blood-stream does not take place until nine to fourteen days later. Timothy bacilli when inoculated in large doses in the same manner rarely reach the blood-stream and then only a few in number even when they invade the neighboring lymph nodes within thirty minutes. Cultures of the lymph nodes made two weeks following the inoculation yield only a poor culture or are completely negative. BCG inoculated even in large doses produces only a localized lesion and a slight swelling of the adjoining lymph nodes.

An experiment was made for the purpose of observing the dispersion of BCG when inoculated in 1 mg. doses into guinea pigs under the skin of the plantar surface of the left hind paw. After intervals from fifteen minutes to twenty-eight hours and six days to two hundred days the animals were sacrificed and their lymph nodes, spleen, liver and lungs were cultured. As with the timothy grass bacillus, BCG reached the neighboring lymph nodes but seldom the blood-stream. The doses of BCG used conferred on the guinea pig a hypersensitivity to tuberculin.—*Sur la dispersion du BCG dans l'organisme du cobaye, A. Boquet & R. Bequignon, Compt. rend. Soc. de biol., June 10, 1939, cxxxi, 578.*—*(M. T. W.)*

Reaction to Killed Tubercle Bacilli.—When living tubercle bacilli are injected into an experimental animal two parallel processes develop, namely, the growth of the injected organisms and the progressively changing response (allergy) of the host. With the use of killed tubercle the first factor is eliminated. The purpose of the present experiments was to determine how the reaction to intraperitoneally injected killed tubercle bacilli is modified by previous skin injections of the same material. Rabbits were used. In the first experiment 9 animals were sensitized with bovine tubercle bacilli killed by autoclaving. The majority of the animals received from ten to twelve intracutaneous injections each of 0.5 mg. of killed bacilli at approximately weekly intervals. In the second experiment the sensitizing bacilli were killed by Arnold steam sterilization. Eight animals received 12 intracutaneous injections of the above at intervals of from five to six days, the first dose being 0.4 mg. and the subsequent doses 0.2 mg. each. Tuberculin skin tests were done at intervals of approximately two weeks. In the third experiment 12 rabbits received a somewhat different treatment with the Arnold killed bacilli. Two were given two simultaneous intracutaneous injections of 0.2 mg. for the first two doses followed by six single injections of the same quantity at intervals of from five to six days. The balance received ten subcutaneous injections of 0.4 mg. at the same interval. The degree of sensitization obtained was determined from time to time by tuberculin. On the completion of these preparatory doses all animals, together with a corresponding number of normal rabbits, were each injected intraperitoneally with 10 mg. of killed bovine bacilli suspended in 5 cc. of physiological saline solution. The normal rabbits assigned to groups 2 and 3 also received a series of tuberculin tests prior to the inoculation with the dead bacilli to make them more comparable controls. A test and control animal in each group were sacrificed at various intervals ranging from ten days to six weeks following the intraperitoneal injection. However, in the last experiment 3 treated animals and their controls were not sacrificed until a much longer period had elapsed, but in the meantime they were subjected to an exploratory laparotomy three weeks after the intraperitoneal injection. The lesions found at autopsy were rated largely by the number and size of the tubercles in the peritoneum and omentum. It was found that the formation of tubercles and of tuberculous tissue occurred more quickly and became more advanced in animals that had received preliminary intracutaneous or subcutaneous injections of killed tubercle bacilli than in their unprepared controls. The difference was greatest three or four weeks after intraperitoneal injection when the lesions in prepared and control animals are at their height. After five weeks no difference in the two groups was evident and later the lesions in both regressed. There was no close relationship between the sensitization present as measured by the tuberculin tests and the extent of the tuberculous lesions. Heat-killed tubercle bacilli caused necrosis with the characteristics of caseation both in the control and the prepared animals, but it was more frequently found in the latter. Caseation was in general more advanced in sensitized animals but there was no exact correlation between sensitization and caseation. Tubercle-like nodules composed of epithelioid cells were often found in the retrosternal lymph nodes, spleen, liver and lungs of both sensitized and control animals. The intraperitoneal injection of heat-killed tubercle bacilli is almost invariably followed after a week or more by much increased sensitization, and sensitization reaches a higher level in previously treated animals than that found in control animals that have had no preparation preceding the intraperitoneal injection. However, after the third week both animals are almost equally sensitized. The two differ conspicuously only during the period shortly after intraperitoneal inoculation.—*The Reaction to Killed Tubercle Bacilli in Normal and Immunized (Sensitized) Rabbits, C. T. Olcott, Am. J. Path., May, 1939, xv, 287.*—*(J. S. W.)*

Tuberculosis in Ascorbic Acid Treated Animals.—Daily oral administration of 10 mg. of l-ascorbic acid to guinea pigs, injected subcutaneously with approximately 500 viable bovine tubercle bacilli, caused in sixty-

four days after inoculation a significant increase in body weight and reduction in the lesions and development of generalized tuberculosis. Animals with hypervitaminosis C showed less caseo-necrotic lesions, more collagenous tissue within and around the tuberculous centres and less dispersion of tubercle bacilli.—*The Role of Vitamin C in the Pathogenesis of Tuberculosis in the Guinea Pig. V. Degree of Tuberculosis in l-ascorbic Acid-Treated and Control Tuberculous Animals, K. E. Birkhaug, Acta tuberc. Scandinav., Fasc. 1-2, 1939, xiii, 52.—(F. B. S.)*

Sulfanilamide in Guinea Pigs.—It was found that sulfanilamide in certain concentrations exerted an inhibitory effect upon the growth of tubercle bacilli *in vitro*, but bactericidal experiments gave negative results. In the present study, a series of guinea pigs, averaging 350 g. in weight, were infected subcutaneously in the left groin with 1 cc. of a suspension which showed on microscopical smear one tubercle bacillus per 100 power oil immersion field. Treatment with sulfanilamide was begun five days after infection in one group, and after ten days in a second group. It was considered better to administer the drug orally in gelatine capsules and to give smaller but more frequent doses. At first a number of animals died as a result of too much sulfanilamide. It was found that daily doses of 340 to 380 mg. of the drug were well tolerated by 350 g. guinea pigs. In the group of animals receiving treatment five days after infection it was observed that the drug had exerted an inhibitory effect in the animals that survived three weeks or were sacrificed after five weeks. There was no macroscopical evidence of tuberculosis in the lungs or liver. The local lesion could not be detected in some animals, regional lymph nodes were small, and the spleens were normal in size but very dark red in color. The control animals showed gross lesions in the liver and spleen, and in some cases in the lungs. The findings in the group that received sulfanilamide ten days after infection were similar to those receiving the drug five days after infection. The inhibitory effect of sulfanilamide is possible even though treatment is interrupted at intervals. The experimental findings do not permit of clinical application.—*The Effect of Sulfanilamide upon the Development of Experimental Tuberculosis in the Guinea Pig, H. C. Ballon & A. Guernon, J. Thoracic Surg., December, 1938, viii, 188.*—(*L. F. B.*)

Sulfanilamide in Experimental Tuberculosis.—Sulfanilamide treatment initiated before or on the day of infection and maintained throughout the experiment failed to affect the course of experimental tuberculosis in the guinea pig. Daily doses of 100 to 300 mg. sulfanilamide were given, some orally and some subcutaneously, and the infecting dose was 0.000,1 mg. of virulent bovine tubercle bacilli (B1).—*Sulfanilamide in Experimental Tuberculosis, M. M. Steinbach & Beatrice M. Dillon, Proc. Soc. Exper. Biol. & Med., June, 1939, xli, 613.*—(*F. B. S.*)

Chemotherapy in Experimental Tuberculosis.—Former experiments were confirmed in that sulfanilamide, when fed to guinea pigs in doses so large as to preclude clinical application because of toxicity, inhibited the tuberculous process. Prontosil soluble, prontosil base, the dimethyl derivative of disulfanilamide (Uleron), diacetyl-diamino-diphenyl-sulphone and benzylamino-benzene sulphonamide (Septazine), given similarly, did not inhibit the tuberculous process. None of the compounds, including sulfanilamide, exerted any influence upon the course of tuberculous infection induced in the rabbit by the intravenous injection of bovine tubercle bacilli.—*Sulfanilamide and Related Compounds in Experimental Tuberculosis, P. H. Greey, G. D. M. Boddington & M. H. Little, Proc. Soc. Exper. Biol. & Med., March, 1939, xl, 418.*—(*F. B. S.*)

Experimental Leprosy.—A recent culture of chrome *B. leprae* produced progressive lesions in the rabbit that grossly and microscopically resembled those seen in human leprosy. The lesions progressed over a period of four months and the bacilli were then recovered in culture with some difficulty.—*Experimental Production of Leprosy in the Rabbit with Chrome Acid-Fast Culture, J. R. Kriz & W. L. Loving, Proc. Soc. Exper. Biol. & Med., April, 1939, xl, 593.*—(*F. B. S.*)

Action of Tuberculous Filtrates on Central Nervous System.—There are no reports in the medical literature of a special investigation of this subject, although Monaldi reported injection of tuberculous ultravirus in the spinal canal of guinea pigs, being able to demonstrate tubercle bacilli in the spinal fluid on smears as early as the sixth day. In a group of 14 cases of hilar adenopathy with complete absence of clinical symptoms, the author found the spinal fluid normal in all cases. In another group of children with active pulmonary tuberculosis the spinal fluid occasionally showed either a slight increase in pressure, or a slight in-

crease in albumen, or more often a slight increase in lymphocytes. In a third group of 9 children with miliary tuberculosis he noted some meningeal and sensory symptoms, such as are observed, with equal frequency, in the course of various acute infections; 6 children had an increase of the intraspinal pressure and of lymphocytes, 2 had a moderate amount of albumen. In all cases cultures of spinal fluid were negative for tubercle bacilli, and guinea pig inoculations caused no changes that could be attributed to a filtrable virus. These observations were not thought to be conclusive, even in the miliary forms. The question, therefore, was studied experimentally by injecting active and inactive tuberculous filtrates intravenously in healthy rabbits, weighing on an average 900 g. In a first group 6 rabbits were injected with doses of 0.2 to 2.0 cc. of active filtrate, one or more times: death occurred in six to thirteen days; in a second group 5 rabbits were injected with doses of 0.3 to 3.0 cc. of inactive filtrates: 4 animals died in from forty-eight hours to thirteen days and one was killed after three months. Although all animals lost an average of 25 per cent of their original weight, they acted and fed well almost to the time of their death. No convulsions or paralytic or spastic phenomena were noted, but fever was present in all cases. Autopsy revealed meningeal hyperaemia in some animals, and slight increase of spinal fluid, which proved negative for tubercle bacilli on smears and cultures. Histologically there were noted only slight perivascular infiltration or slight haemorrhages of the smaller cerebral vessels; 2 rabbits and 2 guinea pigs were also injected with active filtrate—and a similar number with inactive filtrate—in the thigh or in the peritoneal cavity; the only change noted was a slight increase of spinal fluid in those treated with active filtrate. The author therefore concludes that tuberculous filtrates, either active or inactive, will not cause any changes in the central nervous system of experimental animals besides those observed in any acute infection. From his clinical observation he must also conclude that either filtrable viruses do not enter circulation, or that they do not act on the central nervous system, or that the conditions necessary for the localization of these viruses in the central nervous system are lacking. This work leads the author to explain the changes noted in the animals more on a toxic than on an infectious basis. The doses of filtrates used in these experiments seemed, in his opinion, to be high enough.—*Osservazioni cliniche e sperimentali sull'azione dei filtrati tubercolari sul sistema meningo-encefalico, A. Racugno, Riv. di pat. e clin. d. tuberc., November, 1938, xii, 777.*—(*S. L.*)

Virulence in Experimental Tuberculosis.—The evaluation of the virulence of a strain of tubercle bacilli is based on its pathogenicity to laboratory animals. The evaluation of such pathogenicity is based either on the search for the minimal infecting dose, or on the comparative study of the infective action of equal quantities of strains of different cultures. This latter method is generally used. While compiling results during previous research, Fiorio has found it possible to evaluate the degree of virulence of several strains of human tubercle bacilli by means of a simple formula, which takes into consideration various factors observed before and after the natural death of the inoculated animal. Much importance is given to the length of survival following inoculation, to the gravity and extent of specific anatomical changes and to the degree of cachexia as judged by the animal's weight. Virulence of a strain is inversely proportional to the time of survival: Thus $V = \frac{1}{t}$, V being the symbol of virulence, and t that of the time elapsed between inoculation and natural death of the animal. Virulence is also directly proportional to the extent and gravity of the lesions, but is inversely proportional to the time elapsed before natural death of the animal; thus $V = \frac{Ls}{t}$, Ls being the symbol of the extent and gravity of the lesions. Virulence is also directly proportional to the loss of weight, and inversely proportional to the time of survival; thus $V = \frac{P\text{-}p}{t}$, P being the symbol of the initial weight of the animal and p that of the weight at the time of its death. A final factor of importance in this formula is the weight curve observed between the time of inoculation and the death of the animal; this is expressed as Cp, and is directly proportional to the virulence of the strain used: thus $V = \frac{Cp}{t}$. The author then gives the final formula as:

$$V = \frac{1 + Ls + (Cp + (P\text{-}p))}{t}$$

After going into careful detail regarding criteria on which to base symbols, and giving numerical values corresponding to the degrees of the lesions and of typical weight curves, Fiorio concludes by asking for a thorough trial of this formula, in order to

confirm its reliability and convenience. He believes this formula may also be applied to studies of malnutrition and avitaminosis and to evaluate the influence of vaccination, or of any surgical procedure, on the resistance of laboratory animals to the tuberculous infection.—*Di un metodo semplice per misurare la gravitá della tubercolosi sperimentale, specie nei riguardi della valutazione della virulenza, C. Fiorio, Gior. di batteriol. e immunol., May, 1939, xxii, 721.*—(*S. L.*)

Johne's Disease in Laboratory Animals.—Previous attempts to infect small laboratory animals with large doses of *M. paratuberculosis* in salt solution or distilled water have been unsuccessful. One part of organisms from a culture, ground to a creamy consistency, was thoroughly emulsified with two parts of paraffin oil. Seven guinea pigs inoculated intraperitoneally with 2 cc. of this emulsion died in seven to thirty-two days. Postmortem examination demonstrated lesions typical of Johne's disease. With a suspension of the lesions from various organs of these animals, using paraffin or physiological saline, lesions were produced in other animals. The virulence of the organism was apparently greatly increased. Some of the guinea pigs were not as susceptible as others, a certain number of the former remaining alive four to five months after inoculation. One inoculated female gave birth to 6 young. Four were examined immediately and while no lesions were found, smears made directly from the liver demonstrated acid-fast organisms morphologically typical of *M. paratuberculosis*. Numerous strains of organisms have been used and the resulting lesions were identical. Thirty guinea pigs were vaccinated using one part *M. paratuberculosis*, exposed in an Arnold sterilizer to 100°C. for three hours, and one part normal horse serum, mixed with one part of 0.5 per cent sodium carbonate and heated at 100°C. for half an hour. Doses of 1, 2 and 3 cc. were used. After seventeen days the animals were inoculated with a virulent culture of *M. paratuberculosis*. It was evident that the vaccinated animals had become more susceptible to the disease because the majority of them died before the unvaccinated control animals. Rabbits, mice, rats and pigeons have been inoculated and the same type of lesion resulted. Chickens were more difficult to infect. Guinea pigs, rabbits and chickens were inoculated with a suspension of scrapings from the intestine of a cow suspected of having Johne's disease. These animals gave negative reactions to mammalian and avian tuberculin but reacted strongly to johnin. In paraffin oil we have a new vehicle which, when mixed with *M. paratuberculosis*, is highly capable of infecting laboratory animals. The economic advantage of using small animals for diagnosis is self evident. It seems logical to conclude that the oil acts as a culture medium in which the organisms multiply until they overcome the normal tissue resistance.—*Johne's Disease Infection of Laboratory Animals with Aid of Paraffin Oil, W. M. Mohler, J. Am. Vet. M. A., June, 1939, xciv, 590.*—(*L. F. B.*)

Anastomosis of Pulmonary Artery and Systemic Circulation.—In 12 large mature dogs the left subclavian artery was anastomosed to the left pulmonary artery by the method of Carrel. Five animals survived the operation, one died later of distemper, and 2 were sacrificed ninety-six and one hundred sixty-two days after operation. The 2 remaining dogs are in excellent condition, two hundred twenty and two hundred and five days after operation. By this procedure the left lung receives arterial rather than mixed venous blood. The dogs observed for several months after operation appeared entirely normal. The left lung aerated and respiratory movements were normal. The systemic blood pressure was not affected by the operation. Blood pressure in the pulmonary artery a short distance from the anastomosis was less than half that of the systemic arteries, probably because of the relatively low peripheral resistance in the pulmonary vascular bed. The quantity of oxygen consumed by the left lung was very small. When anoxaemia was caused, a larger quantity of oxygen was taken from the left lung by the incompletely oxygenated arterial blood. On gross examination during life, the left lung appeared pinker than the right. Microscopical examination showed no noteworthy changes in either the left pulmonary artery or the left lung.—*Experimental Observations on the Effects of Connecting by Suture the Left Main Pulmonary Artery to the Systemic Circulation, S. E. Levy & A. Blalock, J. Thoracic Surg., June, 1939, viii, 525.*—(*L. F. B.*)

Pseudotuberculosis in Guinea Pigs.—Theobald Smith in 1897 gave the name pseudotuberculosis to the epizootic and enzootic disease caused by *Salmonella* infection in guinea pig herds. The resemblance between this disease and that produced by tubercle bacilli has been pointed out; the present report emphasizes the impossibility of distinguishing the lesions by gross anatomical or histological methods. In a recent outbreak among guinea pigs kept for laboratory purposes, *Salmonella typhimurium* was shown to be the causative

organism. Infection was apparently spread by faeces and urine. Inability to demonstrate the organism in faecal culture did not prove the animal free of the disease, for the organisms were most often found in the spleen. The author concludes that the demonstration of tubercle bacilli in routine smears made from the caseous lesions in the guinea pig is the only reliable way to exclude pseudotuberculosis.—*Similarity of Chronic Infections with Salmonella typhimurium and Tuberculosis in Guinea Pigs, E. A. Birge, Am. J. Pub. Health, October, 1939, xxix, 1125.*—(*H. L. I.*)

Experimental Pulmonary Embolism.—Massive pulmonary embolism in the major pulmonary arteries of the dog was produced by introducing into the circulation, by way of the jugular vein, a section of Penrose tubing filled with fluid. It was found that such embolism is associated with a decrease in cardiac output and arterial blood pressure, increase in cyanide circulation time, increase in heart and respiratory rates, sometimes with an arterial anoxaemia probably due to impairment of the permeability of the pulmonary membranes, frequently with an unchanged or an increased circulating blood volume attributable to a discharge of erythrocytes from the spleen, usually with permanent or transient changes in the S-T segment and T-waves of the electrocardiogram, and usually without significant changes in venous pressure, ether circulation time, oxygen consumption or total plasma solids. Death is probably caused by anoxia of the brain or of the heart with secondary acute heart failure, or both. The anoxia is due primarily to decreased cardiac output and secondarily in some experiments to arterial anoxaemia. The decreased cardiac output is caused by a major obstruction in one portion of the double circuit of the blood-vascular system and therefore represents a hitherto unemphasized distinct form of shock.—*Experimental Pulmonary Embolism, M. Mendlowitz, J. Thoracic Surg., December, 1938, viii, 204.*—(*L. F. B.*)

Erythrocyte Sedimentation.—The effect of erythrocyte concentration on sedimentation rate has been investigated on 121 individuals. Preliminary investigation into certain points of technique was made. Citrated blood was found to give more consistent results than oxalated blood. It is essential to have the same height of blood column for a series of tests; 100 mm. is a serviceable height. Polycythaemia has a retarding effect and may disguise a pathological condition. Anaemia has an accelerating effect which is magnified in conditions causing rapid sedimentation. It is occasionally associated with very slow rates. Recovery from anaemia with subnormal sedimentation may be associated with a rise in rate. No charted system of correction for changes in blood count is satisfactory. For special cases and research work the count may be adjusted to a standard concentration (for example, 5,000,000).—*Sedimentation Rate in Relation to the Red Cell Count, N. H. Schuster, Tubercle, September, 1938, xix, 529.*—(*A. P.*)

Erythrocyte Sedimentation.—The erythrocyte sedimentation rate is of no diagnostic value as nearly one-quarter of cases of demonstrable tuberculosis of all stages showed constantly normal rates. The rate is of no value in determining the extent of the pulmonary lesion. Many patients in the low groups had advanced disease; however, most of these were relatively inactive or nonprogressive. A few were definitely active but usually in these the rate eventually increased. In the presence of clinically demonstrable tuberculosis, acceleration of sedimentation definitely indicates or at least suggests active and progressive disease. The degree of acceleration is generally more or less parallel to the severity and intensity of the process, as indicated by symptoms, signs and clinical course. Patients with cavitation, especially with mixed infection, give much greater acceleration than those without cavitation. Also higher rates occur with exudative than productive forms. Some far advanced rapidly progressive cases showed slowing probably due to anergy. Slowing of the sedimentation rate, or return to a normal level, is a striking and usual accompaniment of clinical improvement and subsidence of toxaemia. The number of deaths were found to increase with acceleration of sedimentation. The test is of considerable significance in the treatment of patients as regards rest and exercise. The sedimentation rate is of no value in differential diagnosis between tuberculous and other pulmonary diseases but is of some value in differentiating inflammatory and noninflammatory lesions. In a small minority of patients the sedimentation rate is a more sensitive indication of their condition than the clinical symptoms. Its greatest value, however, lies in prognosis.—*The Erythrocyte Sedimentation Rate in Pulmonary Tuberculosis, A. Rest, Tubercle, April, 1938, xix, 307.*—(*A. P.*)

Vitamin C and Blood Picture.—The most notable changes in a haematological study on tuberculous guinea pigs subjected to continued hypervitaminosis C for seven weeks were the following: (*1*) a very slight

increase in the red blood cell count and haemoglobin content, (*2*) usually a decrease in the leucocyte count, (*3*) a persistently higher neutrophile-lymphocyte ratio, and (*4*) a lower monocyte-lymphocyte ratio. There was no influence on the basophilic and eosinophilic granulocytes, nor on the Arneth count.—*Role of Vitamin C in the Pathogenesis of Tuberculosis in the Guinea Pig. III. Quantitative Variations in the Haemogram of l-Ascorbic Acid Treated and Control Tuberculous Animals, K. E. Birkhaug, Acta tuberc. Scandinav., 1938, Fasc. 4, xii, 359.*—(*F. B. S.*)

Takata Reaction in Pulmonary Tuberculosis.—A high percentage of positive Takata reactions in pulmonary tuberculosis has been frequently reported. A positive reaction is almost certainly an indication of liver damage; this damage does not involve all the functions of the liver. In the opinion of the author, based on the work of others and his own clinical observations, the Takata reaction indicates liver damage arising on an allergic basis. This conception would explain the frequency of a positive Takata reaction in cases of acute glomerulonephritis and infectious arthritis. Thus the positive Takata reaction in pulmonary tuberculosis is evidence of a serous hepatitis, analogous to a serous pleuritis or peritonitis. These allergic reactions are based upon an antigen-antibody reaction and are, therefore, more frequent in haematogenous tuberculosis where the body is subjected to frequent general dissemination of the tubercle bacilli. Of 35 cases of pulmonary tuberculosis with positive Takata reaction, 23, or 66 per cent, were definitely of the haematogenous type as shown by the clinical findings and roentgen pictures. Seven cases were most probably haematogenous; in only 5 cases could no evidence of haematogenous disease be found. Of the cases with negative Takata reaction, 2 were definitely of the haematogenous type, one was probably haematogenous, and 13 showed no evidence of haematogenous disease. This concept of the Takata reaction would also explain the lack of correspondence between the Takata test and other liver function tests which reflect damage to the liver cell itself. This is explained by the fact that allergic reactions involve primarily the walls of capillaries.—*Über die Takata-Reaktion bei Lungentuberkulose, F. E. Schmengler, Klin. Wchnschr., May 27, 1939, xviii, 742.*—(*H. R. N.*)

Basophilic Aggregation Test in Cement Workers.—Polychromasia, punctate stippling and reticulation are different manifestations of the presence of basophilic substances. A stippled cell count of 1,000 per million red blood cells (0.1 per cent) would be equivalent to a very low basophilic aggregation reading. To examine the claim that cement workers present higher numbers of stippled cells than persons presenting evidence of lead poisoning, the basophilic aggregation test was applied to a large number of cement workers employed in the same plant. One hundred thirty-six men were examined according to the technique of McCord. They were divided into two groups, one of 63 men with dust exposure and one of 73 men having no dust exposure. Eight workmen exposed to limestone dust had an average basophilic aggregation of 0.56 per cent. Twelve men exposed to limestone and shale dusts had an average basophilic aggregation of 0.55 per cent. For 43 men exposed to cement dust the average basophilic aggregation was 0.62 per cent. The highest value obtained was 1.7 per cent. Of the 73 men without dust exposure the highest basophilic aggregation was 1.2 per cent, while the group average was 0.52 per cent. The average age of the workmen was forty years with an average employment of ten years. There is no significant variation in the results obtained from any of the groups of men tested and there was no cell pathology suggestive of that found among workers absorbing lead.—*The Basophilic Aggregation Test Applied to Cement Workers, F. R. Holden & C. E. Ralston, J. Indust. Hyg. & Toxicol., January, 1939, xxi, 5.*—(*L. F. B.*)

Positive Pressure Breathing.—Normally, the lumina of the smaller bronchi enlarge on inspiration and constrict during expiration. In asthmatic dyspnoea there is additional pathological constriction of the bronchi during expiration, accounting for the prolonged expiratory phase. In this condition the intrapleural pressure is increased during the inspiratory cycle. When air, oxygen or a mixture of helium and oxygen is breathed under a positive pressure of 5 cm. of water, this abnormally negative pressure is diminished and dyspnoea is alleviated. At the same time, during the expiratory cycle, the use of positive pressure appears to have advantage of an internal distending force within the bronchi which tends to diminish their constriction. Clinically, relief has been obtained by positive pressure breathing in cases of mild or moderately severe continuous asthmatic dyspnoea. Seven patients with asthmatic dyspnoea were given intratracheal injections of iodized poppy-seed oil. Chest roentgenograms were then taken at the end of inspiration and expiration, before and during the inhalation of air under positive pressure. The pressure

used was 5 cm. of water at the end of inspiration and 8 cm. at the end of expiration. In all 7 patients, at the end of expiration under positive pressure, the widths of the observed branches of the bronchi showed an increase. The smaller bronchi showed an enlargement of 1 mm. in diameter and the moderately sized bronchi 2 mm. in diameter when expiration was carried out under positive pressure. No consistent changes were seen at the end of inspiration.—*Effect of Breathing Gases under Positive Pressure on Lumens of Small and Medium Sized Bronchi, A. L. Barach & P. Swenson, Arch. Int. Med., May, 1939, lxiii, 946.*—(*H. R. N.*)

Arterial and Venous Pressures.—The effect of positive inflation of the lung on the circulation has not received much attention. It has been shown experimentally that the amount of blood pumped each minute through the heart of anaesthetized dogs falls as the pressure of the gas within their lungs is increased. Decreased cardiac output may be attributed to compression of the heart and its afferent vessels which interferes with filling or compression of the pulmonary vessels which interferes with emptying. In a group of 4 dogs, venous pressure readings were obtained while the lungs of the animals with chests wide open were insufflated at various pressures. In a group of 6 dogs, following curarization, venous pressures were obtained during insufflation at varying pressures both before and after opening the chest. In 4 curarized animals tracings of pulmonary and carotid artery pressures in addition to venous pressures were obtained after opening the chest. In 2 open-chest experiments, the changes in pulmonary and carotid artery pressures which accompany insufflation at increasing pressures were contracted with the changes in these pressures following ligation of the root of one lung. It was found that a rise in intratracheal pressure was always associated with a rise in venous pressure. As the intratracheal pressure was increased, venous pressure rose more rapidly when the chest was closed than when it was open. When the intratracheal pressure was increased, pressure in the carotid decreased while that in the pulmonary artery increased. The increase in pulmonary artery pressure accompanying insufflation of the lungs at increasing pressures was usually associated with a decrease in pulmonary pulse pressure, while the rise in pulmonary artery pressure which followed ligation of the right lung was always associated with an increased pulmonary pulse pressure. These findings indicate that the decrease in cardiac output associated with positive insufflation of the lungs is due to compression of the heart which interferes with its filling rather than to compression of the pulmonary vessels which would interfere with its emptying.—*Studies of the Jugular, Carotid, and Pulmonary Pressures of Anesthetized Dogs during Positive Inflation of the Lungs, G. H. Humphreys, R. L. Moore & H. Barkley, J. Thoracic Surg., June, 1939, viii, 553.*—(*L. F. B.*)

Cinefluoroscopic Studies of Breathing.—The images projected on a special fluoroscopic screen were recorded on moving picture film. The camera used was the Bell and Howell 70 D Filmo, equipped with a Zeiss Biotar F 0.85 lens. Either Agfa Superpan Supreme or Eastman XXX negative film was used. A General Electric 10 R.W. tube was used and exposures of from 5 to 10 seconds were made at a potential of about 100 kv. and a current of 100 ma. Flexibility of the mediastinum may be noted from a slight degree to that of a pendulum movement with respiration, or mediastinal flutter, or it may be localized and herniate to the opposite side. Paradoxical motion of the diaphragm is described as the ascent of one leaf of the diaphragm during inspiration while the contralateral leaf descends normally. It is caused by loss of nerve conduction of the phrenic nerve either through disease, trauma or operation. Paradoxical breathing means the deflation of a lung or a portion of a lung during the phase of inspiration. Intrapleural pressure is not the same in different portions of the chest. Atmospheric pressure on the chest after thoracoplasty compresses the operated side more strongly than the rigid unoperated side and so forces some "old" air into other portions of the same lung through interbronchial communications. This acts as a vicious cycle in that dyspnoea, already present, is increased by further lack of oxygen. Symptoms usually subside in from four to six weeks due to readjustment of contralateral lung and further stabilizing of the chest wall. In paradoxical breathing the whole bony cage, independent of its contents, has a pivoted swing with its upper portion attached to a fixed point, the vertebral column and lower part swinging from side to side. Little or no mediastinal shift has been seen in the presence of paradoxical breathing in thoracoplasty cases.—*Cinefluoroscopic Studies of Peculiar Breathing and Chest Motion, O. C. Pickhardt, W. H. Stewart & G. Thorburn, J. Thoracic Surg., June, 1939, viii, 512.*—(*L. F. B.*)

Absorption of Pleural Fluids.—A series of experiments was conducted, using dogs as subjects, to study the rate of absorption of

fluid from the pleural cavity in the presence, and in the absence, of pneumothorax. Ten cc. of saline per kilogram of body weight were injected and for those animals receiving pneumothorax, 20 cc. of air per kilogram of body weight were injected before the introduction of the saline. It was found that the rate of absorption was decreased during quiet breathing in the presence of pneumothorax. In one group, a solution containing 0.25 cc. of phenolsulphonephthalein in each 100 cc. of isotonic saline was used. The absorption rate was slower when pneumothorax was present. In another group, without pneumothorax but in which the rate and depth of respiration were varied, the absorption rate increased with increase in rate and depth of respiration. In a similar group, part of which received pneumothorax as well as having rate and depth of respiration varied, the absorption rate of fluid was decreased by the presence of the pneumothorax. Comparing this group with the first group, it appeared that deep, rapid respirations probably more than offset the tendency of the pneumothorax to slow the rate of absorption. In clinical pleural effusions the factors of absorption and transudation are both present and the above described experiments must be applied with caution.—*Effect of Pneumothorax on the Rate of Pleural Absorption of Fluids, H. C. Maier, J. Thoracic Surg., February, 1939, viii, 283.*—(*L. F. B.*)

Pulmonary Capillaries in Experimental Pneumothorax.—Dogs and monkeys were used for this study. In dogs, due to a pervious mediastinal septum, it is not possible to limit the pneumothorax to one side only; therefore, several animals were used as controls. An intravenous rapid injection of about 50 cc. of 1 per cent solution of India ink in Ringer solution was given to all animals, who were then killed within three minutes by a temporal shot. The lungs were immediately removed *in toto*, washed under the tap, fixed in alcohol and sections were stained with haematoxylin-eosin. In the normal dogs used as controls and in the uncompressed lungs of the monkeys, the india ink could be seen as small black islands or as long thin lines of minute black granules, homogeneously distributed in the distended parenchyma, representing the larger and the smaller capillaries of the lung. In dogs subjected to the experimental pneumothorax and in the collapsed lungs of monkeys similarly experimented upon, the histological examination of the lungs showed somewhat smaller black islands. The thin lines of black granules were proportionally fewer as the retraction of the lung was greater. The conclusion is that the capillaries of the lung collapse after the retraction of the viscera, and that the greater the retraction the greater the number of capillaries excluded from circulation. The larger vessels on the other hand, remain open, thus assuring the continuation of haemodynamic regularity.—*La circolazione nei piccoli vasi del polmone sottoposto a pneumotorace sperimentale, V. Monaldi, R. Ferretti & E. Costantini, Ann. Istituto Carlo Forlanini, November–December, 1938, ii, 885.*—(*S. L.*)

Acid-fast Bacilli.—Examination of the sputum for tubercle bacilli is of paramount importance in the diagnosis and treatment of pulmonary tuberculosis. It is desirable to employ a technique for examination which is as reliable as possible. Direct sputum examinations are not reliable because the sputum is mixed with saliva and therefore a positive result depends upon the care with which the technician selects the material to be examined. Digestion and concentration methods obviate this need for selection of suitable material and, by utilizing a large amount of material, greatly increase the chances of finding tubercle bacilli. One great need in perfecting this method has been that of some compound which could digest the sputum more completely and with less effort and still not alter the staining properties of the tubercle bacillus. This compound has been found to be "Tergitol," a secondary alcohol containing ten to twenty-one carbon atoms near the centre of the hydrocarbon chain. A dilution of one part of "Tergitol" penetrant Number 08, one part of 4 per cent sodium hydroxide and one part of distilled water has been found to be most satisfactory. After being mixed these three ingredients make a stable solution which keeps indefinitely. Ordinarily the mixture is used in an amount equal to the amount of material to be digested. If the material is very thick and tenacious, a larger amount of the "Tergitol" mixture must be used. After mixing the material to be examined and the "Tergitol," the solution is incubated at 37.5° C. for one hour, centrifuged, and slides prepared from the sediment. Since it is desirable to reduce to a minimum the number of operations in the examination of sputum, a new sputum bottle has been devised. This collecting bottle has outside measurements of one and three-eighths by four inches and has a conical bottom; it has a capacity of 35 cc. Its size and shape are such that it can be used as a centrifuge tube. After the bottles and rubber stoppers have been thoroughly cleaned and sterilized, 10 cc. of "Tergitol"

mixture are placed in each bottle. The bottle is then given to the patient who has been instructed to deposit his sputum in it. After complete homogenization of the sputum has taken place the bottle is placed in a Babcock holder and centrifuged for ten minutes. The supernatant fluid is decanted and the sediment spread on slides. The slides are dried and stained. It has been found that, as the temperature of the stain and the time of exposure to the stain increased, tubercle bacilli became less and less resistant to acid-alcohol decolorization. Therefore, the proper heating of the stain and correct time of exposure are important. The method is to place the special holders with prepared slides vertically in jars containing the stain which has been heated to 45° C. The current of the stove is then turned off and the stain allowed to cool for ten to fifteen minutes. The slides are removed and allowed to cool in the air. First they are washed by dipping in and out of a large jar of water, then decolorized by dipping in acid-alcohol until they are of a pinkish-gray color. This is followed by washing in water, then in 95 per cent alcohol and again in water. The slides are counterstained with 1.0 per cent aqueous brilliant green, and again washed in water and finally dried. Since this is a mass staining method by which up to fifteen slides may be stained at once, it is important that the density of the material on the slides be as uniform as possible. Furthermore, the temperature of the stain must not be over 50° C.—*A New Concentration and Staining Method for Demonstrating Acid-fast Bacilli in Sputa and Other Tuberculous Matter, S. A. Petroff & P. Schain, Quart. Bull. Sea View Hosp., January, 1939, iv, 145.—(A. A. E.)*

Culture of Tubercle Bacilli.—The material for culture is treated with 5 per cent oxalic acid for thirty minutes to one hour at 37° C. or for about two hours at room temperature, neutralized with a buffered neutralizing and diluting solution and seeded on potato cylinders, or egg-yolk medium contained in vials with screw caps lined with compressed cork. When the presence of bovine tubercle bacilli is suspected the media should include vials of potato or egg-yolk medium prepared without glycerol.—*A Simple Procedure for the Diagnostic Culture of Tubercle Bacilli, H. J. Corper, J. Lab. & Clin. Med., August, 1938, xxiii, 1195.—(F. G. P.)*

Key to Abstractors

A. A. E.: Adrian A. Ehler, New Rochelle, New York.
A. B. C.: Adele B. Cohn, Bedford Hills, New York.
A. B. T.: Alice B. Tobler, Bedford Hills, New York.
A. H. C.: A. Hazel Curry, Oneonta, New York.
A. P.: Andrew Peters, Springfield, Massachusetts.
C. C. M.: C. C. Macklin, London, Canada.
C. L. D.: Charles L. Dunham, Chicago, Illinois.
F. B. S.: Florence B. Seibert, Philadelphia, Pennsylvania.
F. G. K.: F. G. Kautz, New York City.
F. G. P.: Frank G. Petrik, Oneonta, New York.
F. J. P.: F. J. Phillips, Northville, Michigan.
G. F. M.: Gertrude F. Mitchell, Detroit, Michigan.
G. L. L.: George L. Leslie, Howell, Michigan.
H. L. I.: Harold L. Israel, Philadelphia, Pennsylvania.
H. R. N.: H. R. Nayer, New York City.
J. S. W.: J. Stanley Woolley, Liberty, New York.
L. F. B.: Lauren F. Busby, Northville, Michigan.
M. A. B.: Morris A. Brand, New York City.
M. B.: Miriam Brailey, Baltimore, Maryland.
M. T. W.: Mildred T. Woolley, Charleston, West Virginia.
S. L.: Salvatore Lojacono, Howell, Michigan.